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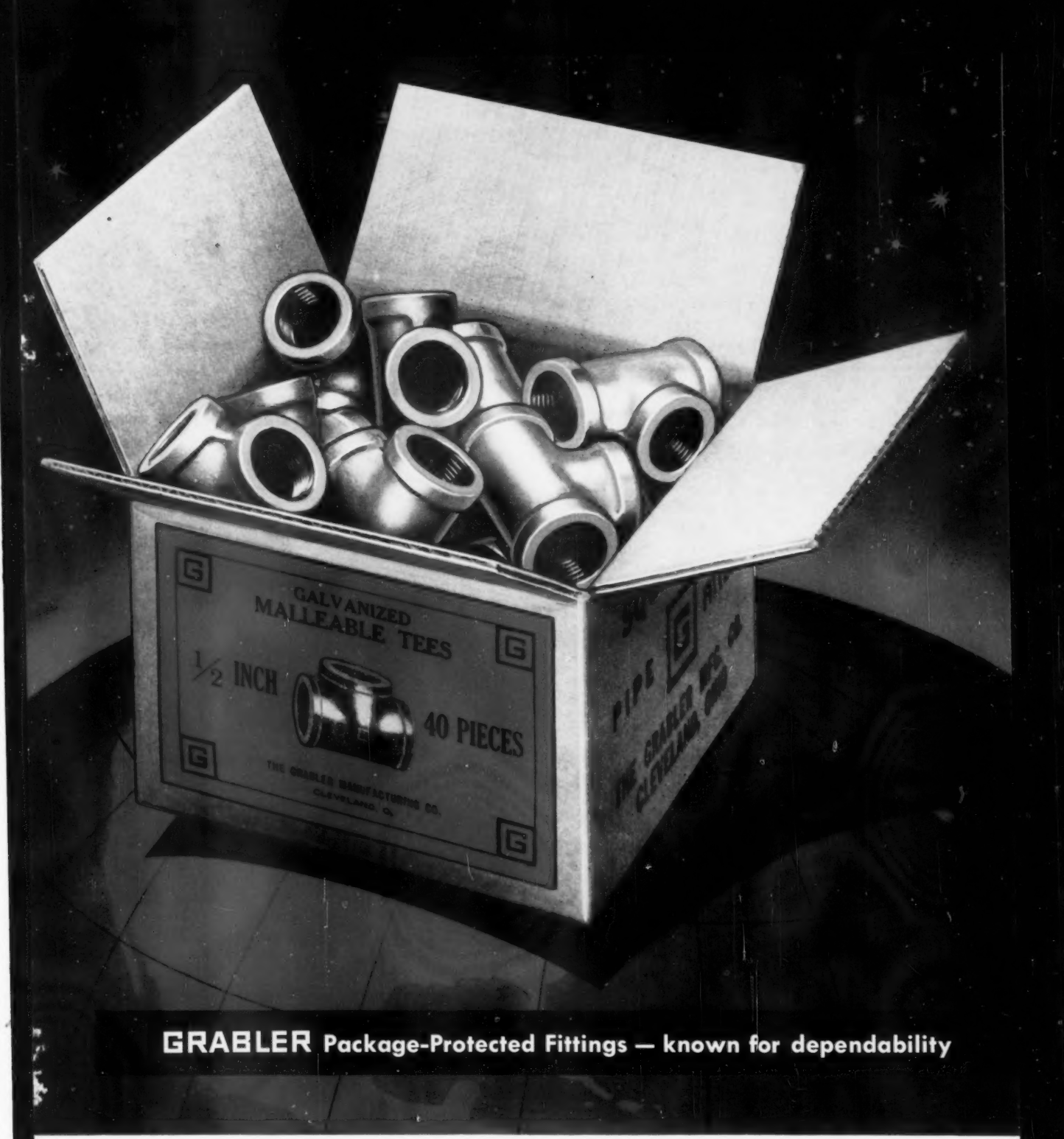

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GAS is published monthly. Copyright 1958 by Chilton Company. 56th and Chestnut Streets, Philadelphia 39, Pa. Subscription price: United States and possessions and Canada (in advance): one year, $2.00; two years, $3.00. Mexico, South and Central America, Caribbean Area: one year, $3.00; two years, $5.00. All other countries: $10 per year.
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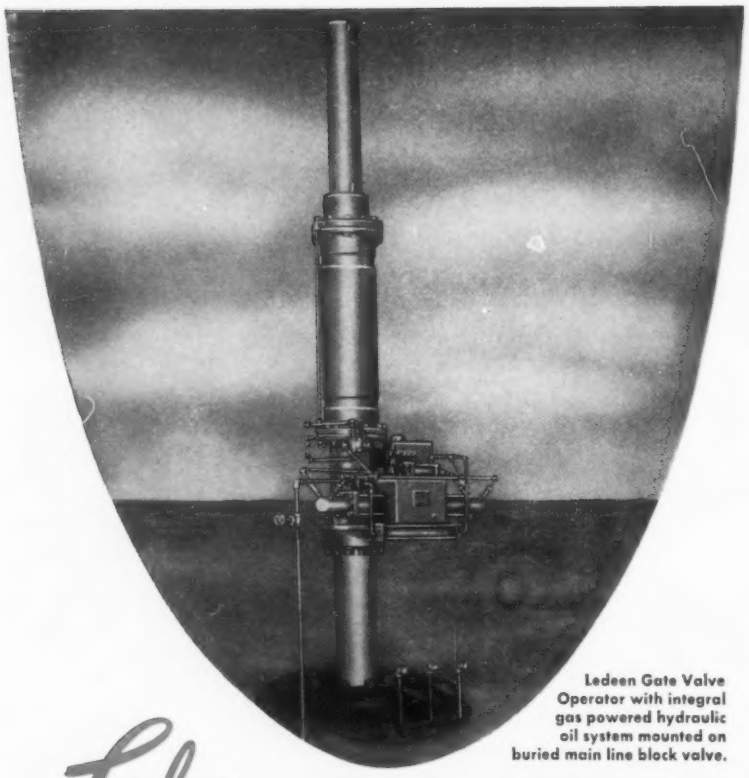

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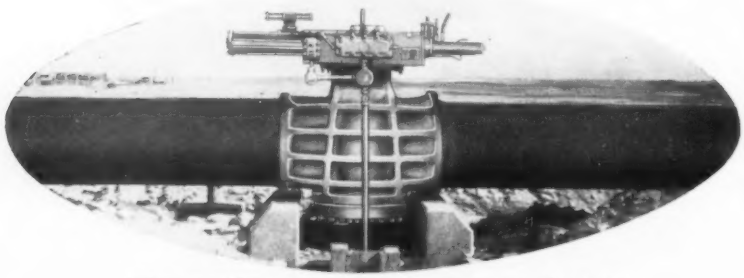

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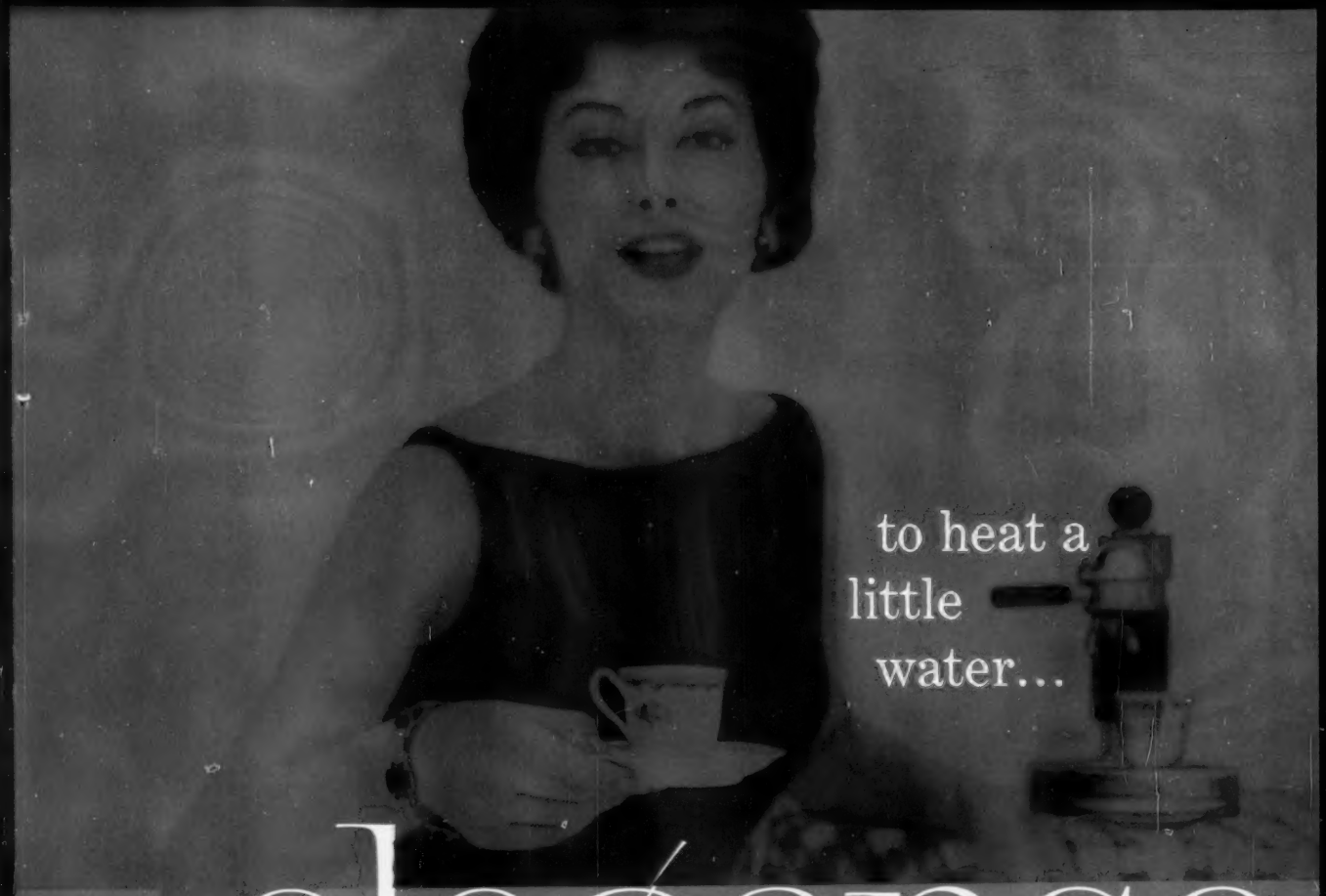

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GAS

JULY 1958

Thermally Thinking

IT is no news to anyone to learn that cooperation is a basic force in this old world. At home, we either cooperate with our wives or else. It is essential that young lovers cooperate, I am told. Nations have to cooperate or a lot of people get hurt. The gas industry needs some internal cooperation, too.

I do not for a minute suggest that there should be no basic policy differences within the industry. Actually, the segments are different and there are rugged individualists within each gas industry group. This is how it should be. But we should keep these differences within the industry and work out cooperation therein also.

I am reminded of a particularly individualist pipeliner I once knew. Tangle-Eye Tennyson was his name. He was a division pipeline superintendent in southeast Texas for a major natural gas transmission company. He was a good man to have around a pipeline.

This man asked for and got cooperation from his fellow employees, his superiors, and his crews. If he ran up against a problem dealing with lack of cooperation, he had only one rule. Get the man or men aside, talk to them, use a few more persuasive tactics if needed and work it out. And he worked out some rough ones back there in east Texas. He didn't call on outside help or forces and he didn't "urge" cooperation in public.

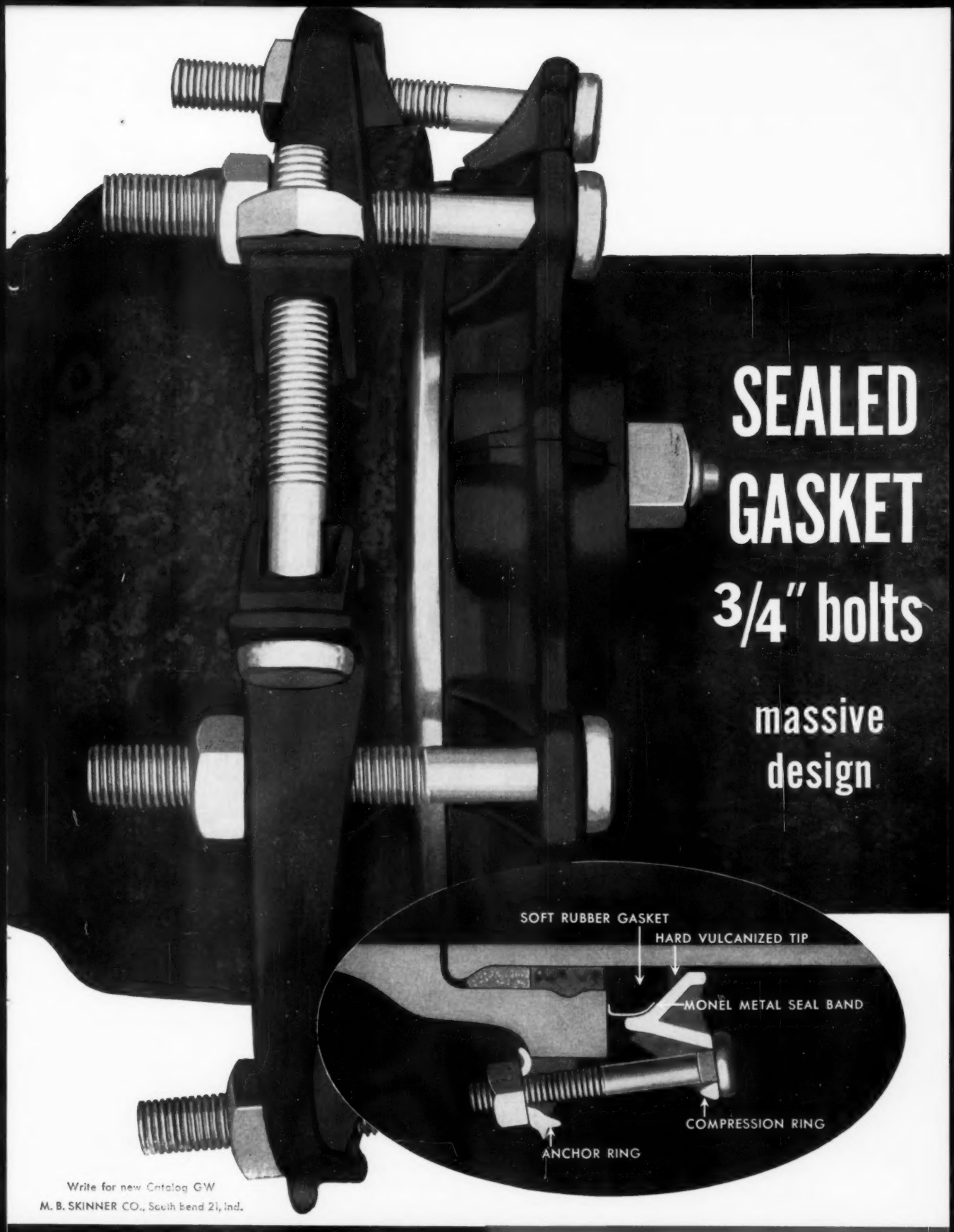
At a recent meeting on automation held by GAS, one pipeline engineer stated that his company needed a distributor to work with it on a cooperative venture that would produce feedback information to close the loop and provide a highly important step toward fully automated operation in the future. Someone mentioned that this would really be a problem in cooperation as the matter involved was measurement for billing purposes.

Another man at the meeting—an engineering executive from a major distribution company—had this to say about the statement that there will be a problem in getting a distributor to cooperate with a pipeline company on a new billing meter technique: "In all justice, in reference to the distribution companies, I want to take exception to that statement. I don't think that is true. There is a feeling that it is true, but I think this feeling is largely due to one thing. We are both in a different picture and we haven't taken the time to find out what the other's problems are. We just don't know each other's problems. In my company's relations with its pipeline supplier, we learned the hard way that we really have mutual problems and we just had to work them out cooperatively. You would be surprised how much difference there is in the operations of both companies since we learned to cooperate. And we are still doing the same basic jobs in the same basic ways."

And still another angle is observed. During the developments prior to placing the original and subsequent Harris bill before the Congress, the three segments of the gas industry tried to produce cooperation by enlisting, in some cases, public news media, civic groups and political allies. Thus, when the bill reached debate in the Congress, the poor relationships within our industry lay exposed before the Congress, the judiciary and the public.

This lack of cooperation within the gas industry helped kill these bills. One cannot say if they would have passed under different circumstances. One can guess they would have had a really excellent chance if the forum for airing the industry's own differences had been within the industry rather than in the Congress of the United States.

J. Fred Edson
EDITOR



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GAS HIGHLIGHTS

Houston Corp will acquire Coastal stock

Houston Corp. will soon become the sole owner of the projected Texas-to-Florida pipeline. Houston has reached an agreement with Coastal Transmission Corp. to exchange Houston stock for Coastal. Coastal will become a Houston Corp. subsidiary, along with Houston Texas Gas & Oil Corp. The two subsidiaries will build and operate the pipeline. Under the new structure, F. E. Stanley remains as president, and W. J. Bowen, Coastal president, becomes Houston's senior vice president. Construction on the line now is expected to start Aug. 1.

CIG rebate battle continues to rage

The rebate battle between Colorado Interstate Gas Co. and its Colorado customers rages on. Denver Mayor W. F. Nicholson and Public Service Co. of Colorado, CIG's biggest customer, have rejected a $37 million offer as inadequate. This is the third rebate proposal made this year by CIG. All have been turned down.

Columbia to add Gulf Interstate

Columbia Gas System plans to acquire substantially all assets of Gulf Interstate Gas Co. by the end of this year. If stockholders and governmental agencies agree, Columbia will take over the pipeline through an exchange of stock. Gulf Interstate Gas will be dissolved once the merger has been approved.

Spokane Gas plans $3 million expansion

Spokane Natural Gas Co.'s new owner, Washington Water Power Co., will spend $3 million to expand the gas system in the next 18 months. New distribution systems will be built in Coeur d'Alene and Moscow, Idaho, and existing ones in Pullman and Spokane, Wash., will be enlarged.

Canadians bring in big gas well

A four-company team has brought in what appears to be the most prolific gas producing well in Canadian history. The well—in the Dick Lake field in central Alberta—has an open flow potential of about 280 MMcf/day—almost the current through-put rate in the Trans-Canada pipeline. Operator of the well is British American Oil. Other owners—California-Standard Co., Canadian Husky Oil, and Phillips Petroleum. Alberta & Southern Gas Co. reportedly has a contract calling for substantial quantities of the gas.

TET plans merger of 2 subsidiaries

Texas Eastern Transmission Corp. has asked the FPC for approval to acquire and operate two of its subsidiaries. TET wants to add the Texas Eastern Penn-Jersey Transmission Corp. and Wilcox Trend Gathering System into its own system. Texas Eastern now operates the two as integral parts of its system on a lease basis.

TGT considering industrial line

Tennessee Gas Transmission Co. is reportedly considering building a 1600-mile Louisiana-to-California line to supply gas to two industrial customers. The line, currently labeled Gulf Pacific, would transport gas to Southern California Edison Co. and Pacific Gas & Electric Co. PG&E would use the gas only as fuel for its electric generating plants. Gas would be purchased by the two industrial accounts in the Louisiana fields, and would be transported through the Gulf Pacific line for a fee.

Electric industry eyes gas inroads

The gas industry has been making too many inroads into the electrical industry, General Electric's Ralph J. Cordiner has warned. He urged the electric industry to step up its promotional activities to combat what he described as "a tremendous momentum" developed in recent years by the gas industry.

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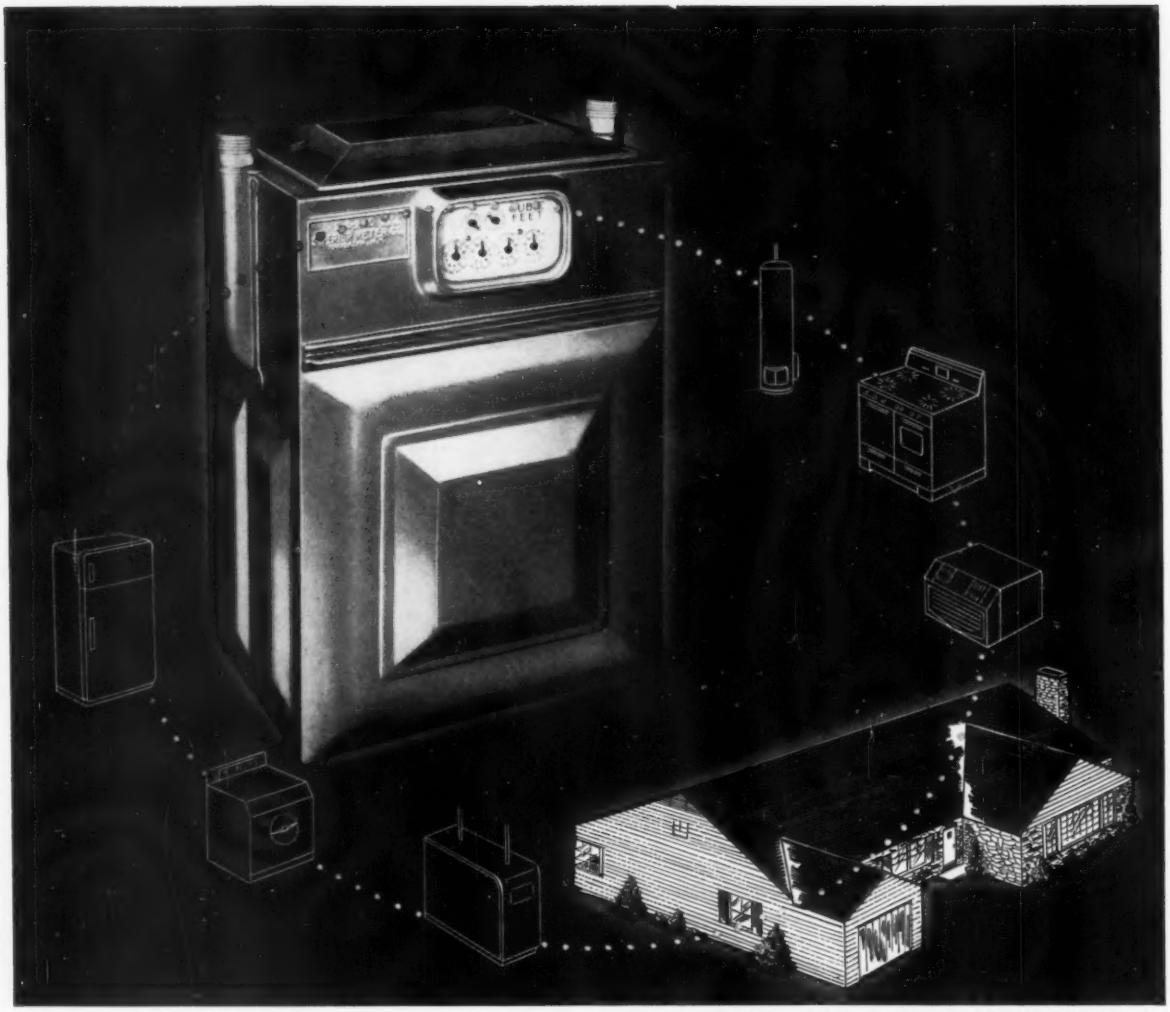

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Regulatory and Legislative Trends

A COMMENTARY ON NATIONAL AND STATE DEVELOPMENTS BY AN EXPERT IN UTILITY LAW

Good-bye minimum gas prices

THOSE states which have fixed minimum field prices for natural gas, in the name of conservation, have been deprived of that power by the United States Supreme Court. The result will be good-bye to minimum gas prices prescribed by the producing states. Congress, however, could amend the Natural Gas Act to return such conservation measures to the states even though the gas is sold in interstate commerce for resale. In two recent decisions, the highest court in the nation told Oklahoma and Kansas that their ordered minimum prices for natural gas were impotent. The Supreme Court ruled that the field price for natural gas which is transported interstate for resale is beyond the authority of the states. Such a sale of gas, including its price, cannot be regulated any longer by a state, but is subject to the exclusive regulation of the Federal Power Commission under the Natural Gas Act. The court followed its startling 1954 Phillips Petroleum Co. decision, in which it declared that gas sold at wholesale in the field and destined interstate was subject to FPC rate regulation. Although the federal power is paramount for interstate commerce only, it is difficult to see how state minimum prices for just the small portion of natural gas sold inside the state of its production could accomplish conservation.

• Reasons for minimum field prices for gas

Let us examine the reasons for state regulation to prevent the physical and economic waste of natural gas. Managements of the three segments of the natural gas industry — production, interstate pipeline transportation, and local distribution — will need to know this subject before it is presented to Congress for remedial legislation.

The Panoma case involving minimum gas prices established by the Oklahoma commission is typical. The Oklahoma Supreme Court affirmed the commission but was reversed by the United States Supreme Court.

The Oklahoma legislature gave the state commission the power to regulate the taking of natural gas from a common source of supply. It was intended to prevent waste, protect the interest of the public and those who had a right to produce the gas. It is an essential implication that the state commission could use any means reasonably necessary to accomplish the purpose of the conservation law. The Oklahoma Supreme Court ruled years ago that the commission had the power to fix the price at which natural gas may be produced from a field when necessary to reach the objective. Price control, like any other form of regulation, is unconstitutional only if it is arbitrary, discriminatory, or unrelated to the announced legislative policy.

Until the recent disturbing decisions by the United States Supreme Court placing exclusive jurisdiction in FPC, the states fixed minimum prices for gas that had an interstate destination. Formerly, the Oklahoma Supreme Court had reasoned that local interests could be protected by minimum prices for natural gas taken from a common reservoir, because the regulation is imposed before the operation of interstate commerce occurs. That concept is no longer usable now that the Federal courts have decided that gas destined for a market outside the state of its origin enters interstate commerce at the wellhead.

The Oklahoma commission considered many factors before fixing minimum gas prices. It changed the prices periodically to keep up with economic conditions. Usually a comparison was made between natural gas and other fuels, such as coal, residual oil, crude oil, kerosene and gasoline. On an energy content basis the fuel source cost of natural gas was much less than the others. Natural gas was found to furnish a high proportion of the nation's mineral energy compared with its small proportion of the total dollar income received for fuels.

Increasing the price of natural gas as taken from the ground would tend to conserve gas and prevent physical waste, said the Oklahoma commission. The higher price would allow wells in the fringe areas of the field to be drilled and operated at a profit. Otherwise such wells could not be economically drilled and would result in non-development of the field. That would mean a loss to the owners of fringe areas and damage to their rights in the common source of natural gas. With higher gas prices, better and more expensive methods of production would become economically feasible which would conserve gas and eliminate blowing out wells to clean them.

The commission thought that if fringe wells are not drilled the gas will migrate to existing wells, causing loss to the fringe owners. The higher gas price was considered necessary while marketing facilities are available. If fringe wells are not drilled until the field is abandoned, very little gas would be left and there would be no mar-

keting facilities available then. About 99 per cent of the gas produced in the Guymon - Hugoton field is transported out of Oklahoma. The field as a whole is producing more gas than it did before but individual wells are producing less, said the commission. The gas of the same quality was sold by producers in the field at different prices. The mineral owners were dissatisfied with their prices and wanted a uniform price throughout the gas field.

There has been a great increase in the demand for natural gas as a fuel and the costs of production have increased likewise, asserted the Oklahoma commission. In the commission's opinion, the interests of Oklahoma would be protected by a gas price which would produce the maximum revenue consistent with maintaining markets. Then the commission prescribed a price for gas in the field which would not disturb the market. That minimum price also would allow thin acreage to be developed and produced, which would prevent migration of gas. The gas field would be fully developed under the price incentive thus protecting the correlative rights of the many owners.

The commission reached its conclusions on conservation of the exhaustible resource—natural gas. It found that without the chosen price increase both physical and economic waste would result. The taking of gas at the old price caused a less return to the royalty owners and to the State of Oklahoma. The former price, according to the commission, results in inequitable taking of gas and in discrimination against various producers. To insure the greatest ultimate recovery of gas from the field, an up-to-date minimum price is necessary. The commission fixed a minimum price for raw gas sold at the wellhead. It fixed the same price for gas sold after gathering plus the reasonable cost of gathering it. The third price was identical with the wellhead price and was for residue gas sold after processing.

- **Oklahoma supreme court likes conservation**

If Congress amends the Natural Gas Act to return conservation, by means of minimum gas prices, to the states then the attitude of the State Supreme Court becomes important.

In the first Panoma case the Oklahoma Supreme Court approved the commission's minimum price order. The court was satisfied that there was substantial evidence to support the commission's findings of fact and conclusions of law. The court gave this sweeping encouragement to the state commission:

"There is substantial evidence to the effect that the prevalent price of raw gas in this field (seven cents per thousand cubic feet as fixed by previous order) will not, under present economic conditions prevailing, such as cost of labor and materials, permit the drilling of wells in fringe areas, resulting in non-development of the field, migration of gas to wells in production to the loss of landowners in fringe areas, and incomplete exhaustion of the gas-bearing structures, all to the loss of landowners, producers, and the State of Oklahoma generally. Such facts constitute both physical and economic waste and amply justify the commission's order on that factor. Certainly such facts clearly show inequitable taking from the common source of supply, irreparable harm to correlative rights of owners, loss to royalty owners, and loss to the State and are sufficient to sustain the interest of the State in correcting such abuses. This is a regulatory order based upon the interest of the State in conserving its natural resources; it is not an order designed merely to increase the earning of producers and processors. Such an order is a proper exercise of the state's police power." * * * "The evidence that the value of the liquid hydrocarbons extracted just about balances the cost of gathering and processing the raw gas is uncontradicted. Certainly such processing constitutes a valuable service to the purchaser. The contracts introduced in evidence are very precise as to exactly what constituents shall remain in the residue gas contracted for. To have any regulation at all, to insure that all gas produced from the structures in this field shall be sold at the same minimum price it was necessary to fix the price of residue gas and the evidence is substantial to show that such price must be the same as that of raw gas to attain this end."

- **Reaction of federal power commission**

The Federal Power Commission is considering a change in its rules, because the United States Supreme Court held that a state cannot lawfully fix a minimum price in the field for natural gas sold in interstate commerce for resale.

FPC is planning to rule upon the non-acceptability of rate changes based upon state-prescribed minimum prices. The general policy statement proposed by FPC to be placed in its rules is:

"Since the Supreme Court has held, in effect, that states cannot lawfully fix a minimum price at the wellhead to be charged for, or attributed to, natural gas where such gas is sold in interstate commerce for resale, the commission will reject any tender for filing pursuant to Section 4 of the Natural Gas Act which would initiate or change the price for the sale of natural gas in interstate commerce for resale to the extent that such filing is based upon a state-prescribed or attributed minimum price. (E. g., Gas Price-Fixing Order of State Corporation Commission of Kansas, entered December 2, 1953 or the corresponding order of the Corporation Commission of Oklahoma.)" ■

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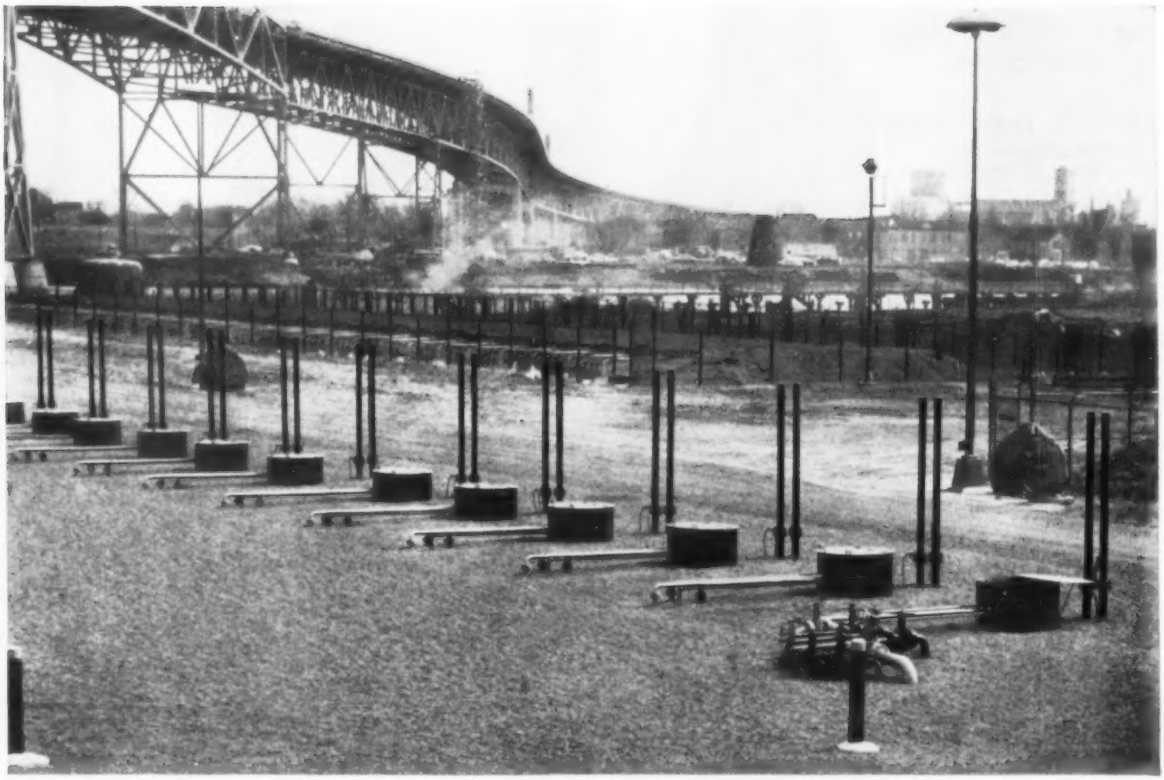

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TECHNICAL TRENDS

By GUY CORFIELD

Fission and fusion power

At a recent western air pollution control conference all aspects were covered including possible air contamination from nuclear power plants. It was stated that within 20 years there would be considerable power produced by nuclear fission. However, within that time the disposal of reaction products would not be a serious problem if the plants were strategically located with respect to populated areas and prevailing winds. Gaseous wastes can be discharged safely from high stacks after removal of aerosols and particulate matter. Liquids can be disposed of in deep wells or abandoned mine shafts. Solids can be buried, or sealed in containers and dumped in the deep ocean.

It appears that this prediction may be conservative. There are already a number of nuclear fission plants in operation, producing heat from which electricity is generated and fed to nearby utility distribution systems. Some of these are purely experimental and the power production is incidental at this time. At Shippingport, Pa., however, in December of last year, the world's first large-scale nuclear power plant, designed and devoted entirely to generation of electricity for civilian use, was put into operation. This plant is of the pressurized water reactor type, producing 60,000 kw from three of its four units, the fourth being kept as spare. It is owned by the Atomic Energy Commission, built by Westinghouse and Stone & Webster, and operated by Duquesne Light Co. Duquesne buys the power from AEC as steam at a price equivalent to 8 mills per kwh. This is of course considerably less than the overall cost of steam, considering the total plant investment and operating costs, background research and experimental work, etc. However, it is estimated that within reasonable future nuclear plants can be built to produce electricity at a basic cost of between 10 and 15 mills per kwh.

AEC is also encouraging research on the use of nuclear fission to provide heat for industrial purposes. This could include, for instance, the gasification of coal, by passing powdered coal and steam through the reactor to produce water gas. In fact, the U. S. Bureau of Mines and AEC started a cooperative study toward this end about 15 months ago. To avoid radioactive contamination of the process gas, and possible poisoning of the reactor by sulfur in the coal, it was proposed to use helium gas as an intermediate heat transfer agent. Work is progressing along this line.

It was predicted, furthermore, that by 1977 fusion reactors will be developed, and that the fusion process will not produce a significant amount of toxic residues. Perhaps this date is highly optimistic as the published literature has so far intimated that the fusion (hydrogen bomb) mechanism is not controllable except as a super destructive weapon. The principal difficulty is in producing, controlling, and containing the reaction temperatures said to be of the order of several million degrees F. However, 20 years ago the concept of nuclear fission power plants, now a reality, would have been rejected except perhaps by a select few.

News items on research and development are now appearing, indicating that work is going on behind the scenes. One briefly described an Atomic Energy Commission project at Princeton university. A device called a Model C Stellarator is to be built as a tool for controlled fusion research. Apparently it involves a "container" within which a mass of heated hydrogen is held in magnetic suspension. Thus the walls of the container will not be in actual contact with the hydrogen, and will not be disintegrated by the heat while the reactions are being promoted and observed.

More recently, Britain and the U. S. (AEC) simultaneously announced experiments in which there was strong evidence that the fusion reaction had been produced, if only for a fraction of a second. The British apparatus was called ZETA (Zero Energy Thermonuclear Apparatus). The U. S. version, smaller in size, was speculatively called the "Perhapsatron." Essentially, a powerful electric charge is passed through the center of a tube containing deuterium (heavy hydrogen) gas. This heats the gas and, together with magnetic coils around the outside, "squeezes" it to a narrow thread in the center of the tube so that the tube does not melt.

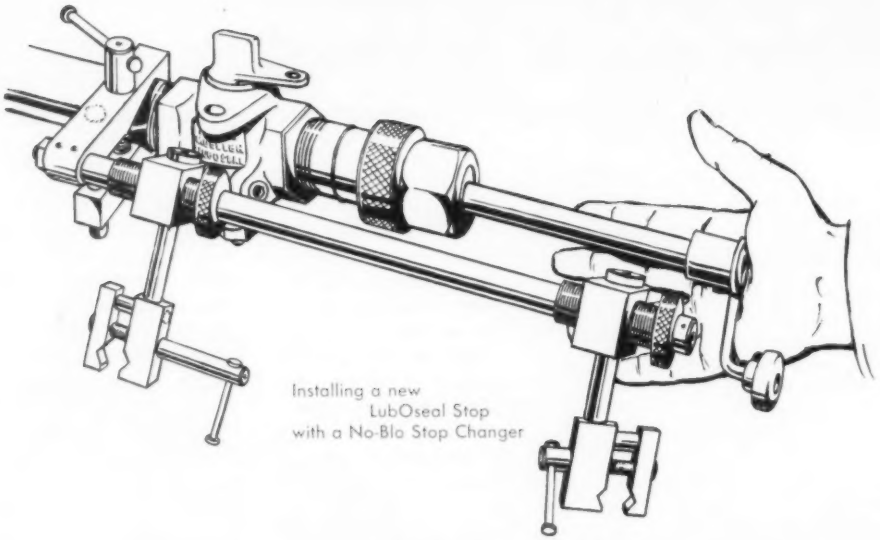
It is rumored that there will be further announcements of successful research at the Second International Conference on Peaceful Uses of Atomic Energy at Geneva in September.

Analysis of crude oil

U. S. Bureau of Mines Report of Investigations 5376, "Analyses of Crude Oils from 470 Important Oil Fields in the United States," has just been issued by the U. S. Department of the Interior. It contains 492 analyses including basic data on gravity, sulfur, viscosity, carbon residue, and distillation ranges dividing the oil into light gasoline, naphtha, kerosine and gas oil, lubricating oil, and residuum. It also gives correlation indices for the fractions, which can be used to indicate the percentage of paraffins, naphthenes and aromatics.

It is interesting to note that the sulfur varies from less than 0.01 to 5.21 weight per cent.

This is a valuable reference book for anyone interested in the subject. It can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of $1.25.



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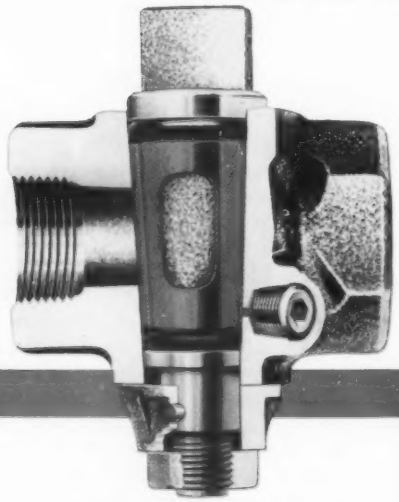

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WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

Regulatory problems continue to mount

GAS bill opponents, with another victory apparently safely under their belts, are reportedly privately convinced gas legislation of the type sought by the producers is now interred permanently.

They may or may not be right. An unobjective appraisal of the future chances for legislation of the Harris-O'Hara type would show that while the chances for any such controversial bill fade with each defeat, there is still a fresh possibility of passage each year. Other bills have suffered similar successions of defeats, and still eventually passed. But the list isn't long.

Thus legislation to free independent gas producers from the present maelstrom of utility-type regulation does stand a chance of exhumation.

One result of the second annual gas legislation fiasco is a flood of advice to the industry to mend its public relations fences. Counsel from within and without has been mounting for the industry to do a better job of "telling its story."

No less a light than Rep. Oren Harris (D., Ark.), co-sponsor of this year's ill-fated gas bill and congressional mentor of at least the producing segment, recently advised the industry to devise a campaign to get its story across in Washington with the full facts of the producers' problems, frankly told.

Basically, that's what's needed. No doubt about it. The public impression that the gas bill is class legislation designed to help a bunch of "filthy rich" gasmen get richer at the expense of the consumer needs a lot of dispelling.

But the gas industry as such needs a million-dollar Madison Avenue high or low pressure "public relations" campaign for gas legislation like it needs the colloquial hole in the head.

Congressional cloakroom whispers report that opponents of gas legislation are praying that this "public relations" approach will be adopted in full power next year if another gas bill is introduced—which is almost a certainty. Nothing, they believe, would help their case more than to uncover just such an approach.

Friends of the gas industry, as far as legislation is concerned, are plumping for a sort of public relations campaign in reverse. It is painfully obvious that the gas industry, particularly the producers, could profit from a much better understanding of Washington. (Washington undoubtedly needs a better understanding of the gas industry — all three segments — but that should probably follow enlightenment of the industry.)

That gas legislation has been killed by its out-of-Washington friends hardly needs saying.

The often rugged-individualist gas producers, and the more urban pipeliners and distributors, large and small, too often forget that Washington is a city and way of life unto itself. Politics is the meat and drink—there are few amateurs. Like championship-class boxers or golfers, they don't overlook the first slip of a competitor and are quick to capitalize on bad timing.

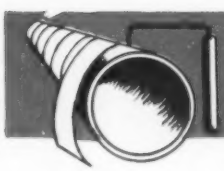
Rep. Harris, a little battle-scarred from previous campaigns, is an almost sure bet to be a sponsor of gas legislation next year. His politics, interests, and probable role again as chairman of the House Commerce Committee almost assure this. He'll again have the all-powerful backing of House Speaker Sam Rayburn (D., Texas), another gas bill supporter.

But these two, and the host of other backers, can't fight city hall —they can't move when the kind of misplays of the past two congresses turn public sentiment against a measure.

Whether this defeat actually buries the gas bill is problematical, but it makes passage harder. And the opponents each year find their position reinforced by the continued high earnings of the gas business as a whole, even though they are the result of continued massive expansion in demand.

Until the first city discovers that gas at the prices government regulation will permit are unavailable, the gas producers will be fighting an uphill battle. And distributors, although this point may be sometime in the future, must face up to a possible gas shortage brought on by government regulation if the backers of this legislation are correct.

Continued on page 83



CORROSION PREVENTION

DISTRIBUTION
TRANSMISSION

By MARSHALL E. PARKER

Test leads for gas transmission lines

JUST as the combination of coating plus cathodic protection has become virtually universal practice for gas transmission lines, so has it become standard practice to install test leads as a part of the construction program. No great degree of uniformity can be seen in these installations, however; many of them are specified without a clear idea of the functions test leads are to perform.

They are, in effect, points of electrical access to the line, and to associated structures whose presence has a bearing on the corrosion status of the line. They will be used (1) in the preliminary survey on which the design of the cathodic protection system will be based; (2) in checking for short-circuited casings and similar structures; (3) in investigating the possibility of interference to or by other pipelines; (4) in adjusting the cathodic protection system after its installation; (5) for the installation of bonds to control interference; (6) for routine supervision of the cathodic protection system after installation; and (7) for various special purposes, such as coating studies and the like.

Test points should be installed at every cased crossing, at every insulated joint (important!), at every crossing line, and at such other places as to give a specified maximum spacing between points. This maximum varies with different companies and conditions; in general, for most transmission lines, five miles is an adequate figure. One word of caution which should not be necessary—do not simply specify a test lead "every two miles" or some similar phrase —or you may get just that; test leads in the middle of cultivated fields, at exact two-mile spacing, with no regard to road crossings or accessibility. Only in relatively undeveloped country is it necessary to install leads in open right-of-way.

Installations may vary from the simplicity of a wire wrapped around a fence post to the formality of a conduit-mounted locked box with a labelled panel inside; usually something in between these extremes is preferred, such as a simple condulet with exposed panel, or a capped 2-in. pipe with a plain, unmounted panel within the cap. Small diameter conduit should be supported; in many locations this can be done by strapping to a vent pipe, or to a wooden post.

Connection to the pipe is usually made by the Cadweld (thermit) process. When high-yield-point steel is used, some operators prefer to attach a steel pad by arc welding, and then to make the Cadweld connection to the pad. In either case, the coating should be carefully repaired with a compatible material. Wire size is usually No. 12 or No. 10; solid wire is most commonly used, although some prefer stranded.

Test points may be classified according to the number and arrangement of the leads, as follows:

Single Lead Test Point: This type is used on the open right-of-way and at cased crossings. No lead is required on the casing itself, as the vent may readily be contacted. Some users attach two leads a foot or so apart, for safety, in case one fails.

The single lead point is used for obtaining pipe/soil potentials, in running current requirement tests, and in maintenance surveys on installed systems. It is also used in checking for short-circuited casings.

Insulated Joint Test Point: Wherever an insulated joint is buried, a lead should be brought out from each side. These two may be brought up to a single post, or to two posts not far apart. The latter method has two advantages; there is little doubt as to which lead is which; and there is little danger that the two leads should become short-circuited together, thereby shorting out the joint. The single post is advantageous is it desired to bond across the joint, but where a single post is used, great care should be taken to guard against short-circuiting.

This type of point is used in cathodic protection surveys and maintenance, as well as its obvious use in checking the insulated joint and in bonding across it, if needed. When a system is in use which feeds through such a bond, an inserted "zero resistance" ammeter will accurately read the line current at that point.

Foreign Line Test Point: At each point of crossing of another pipeline, a test point should be established with a lead from each line. As above, these may be installed on separate posts or on the same, with similar advantages and disadvantages. Again, great care must be taken to avoid accidental short-circuits.

Such points are used in cathodic protection surveys, and more particularly in intereference studies. They may be used for the installation of bonds, either solid or resistance, provided the current is not too high for the wire size. It is quite helpful at such a point to have *two* leads from each line, for then one set of leads can be used for the bond while another set is available for pipe/soil readings free from IR drop error.

Line Current Test Point: Two leads may be attached to the line at a measured distance (from 50 to 400 ft) and brought up in the same box. By the use of a potentiometer

Continued on page 82

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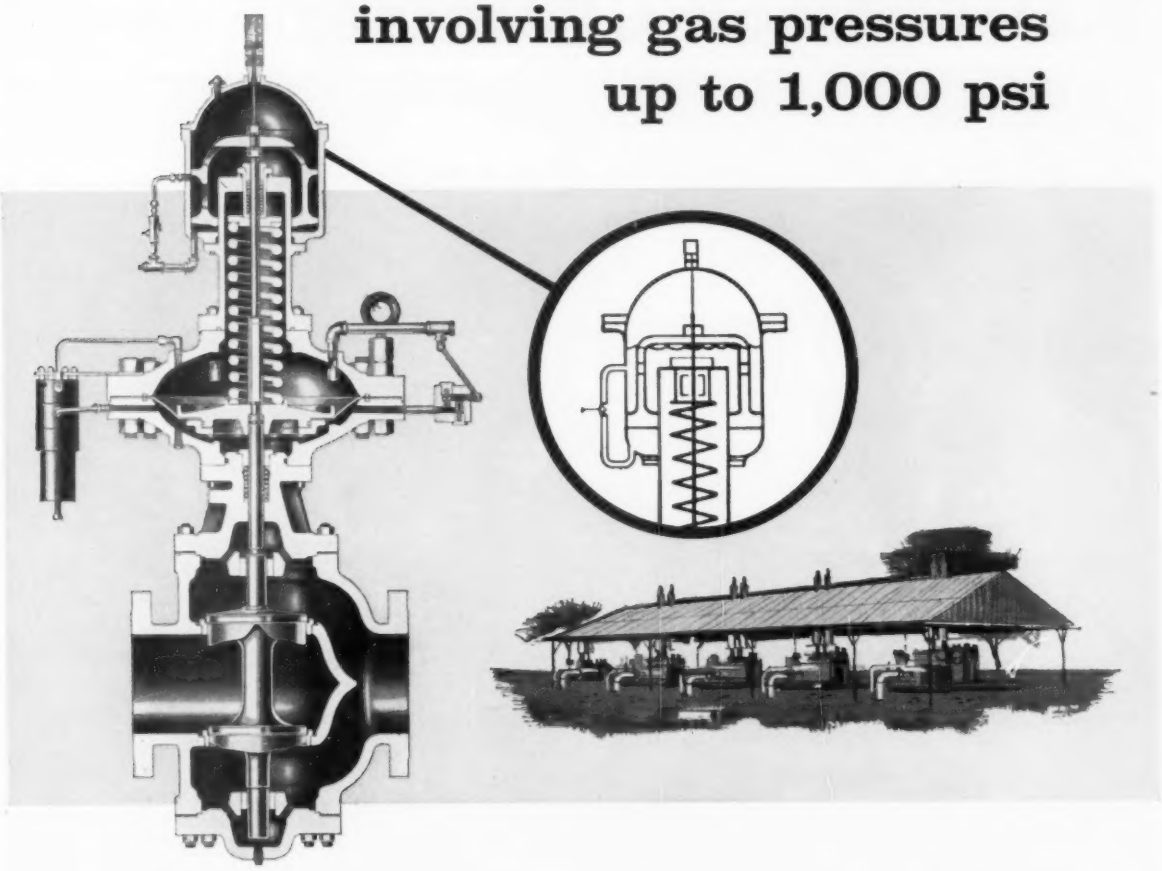
Handles uncommonly rough jobs involving gas pressures up to 1,000 psi



Oil dash pot prevents inner valve "jump"

When the gas industry needs a regulator that can withstand the dynamic forces of large flows and high velocities, it turns to the Fisher Type 885-1. Here's the ideal high pressure gas regulator for the difficult reducing jobs on transmission lines and large town border stations. The inner valve is dampened and cushioned by a special oil dash pot. The inner valve jumping sometimes encountered in high capacity, high pressure systems is eliminated. For further information about the Fisher Type 885-1, send for Bulletin P880-A.

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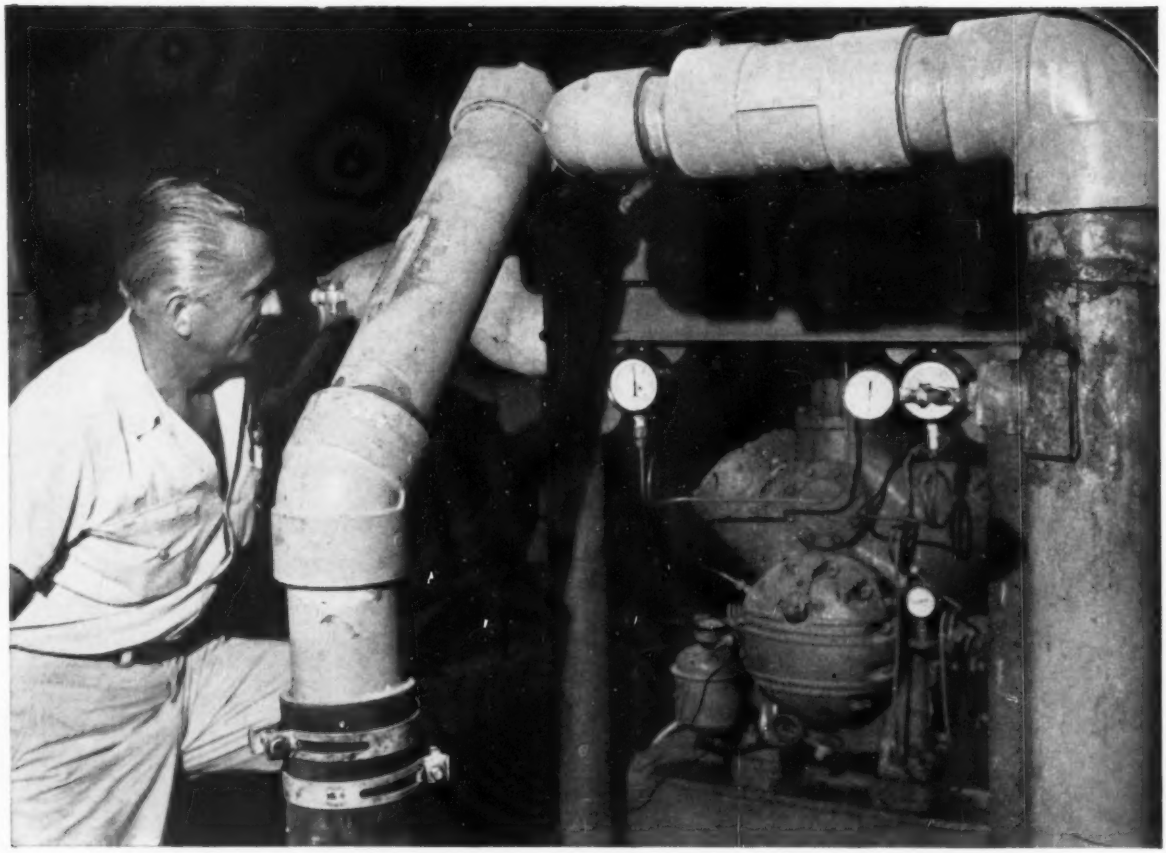

the pipe is made of Geon
handles salt water under pressure: *no corrosion*

NO pipe replacement problem will plague the owners of this Florida air conditioning installation. If ordinary pipe had been used, the corrosive effect of salt water under pressure would soon show up in high replacement costs. But pipe made from Geon rigid vinyl handles the job easily—and permanently. It is not affected by salt water. No galvanic corrosion problem either.

Geon vinyl pipe more than pays its way wherever corrosion is the problem. Installation crews like it, too, because it is lightweight and easy to handle. Can be readily joined by solvent welding.

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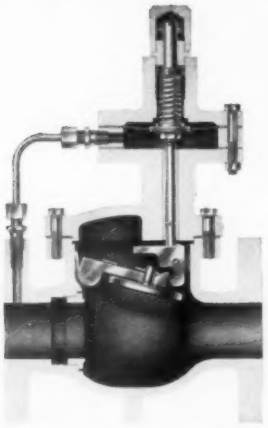
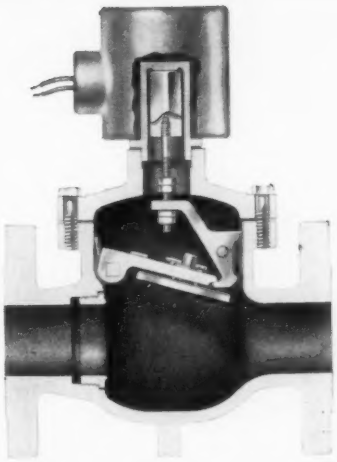


Model 1500H shown, is a high pressure shut-off valve which closes automatically and instantly when predetermined high pressure is reached. With addition of a fusible metal plug, valve can be furnished to shut off on overpressure and/or over-temperature. With control pressure above diaphragm, valve can be made into a low pressure shut-off valve. Combination high and low pressure shut-off also available.



Model 1700 shown, is a Solenoid operated valve normally energized to maintain valve in open position. On interruption of electric current valve closes instantly. Model 1800 Solenoid shut-off valve available to shut off gas instantly by applying electric current either automatically or through a "panic" button.

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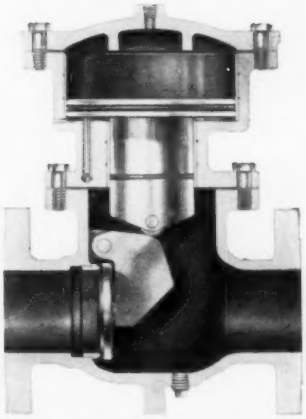

Model 3000 shown, is a piston operated valve, which opens instantly when pressure above the piston is released. Restoring the pressure above the piston closes the valve. The operating pressure above the piston can be obtained from the line or from an independent source of gas or liquid and can be automatically released or applied by instrument air or gas operated pilots or by use of a small three-way Solenoid valve.

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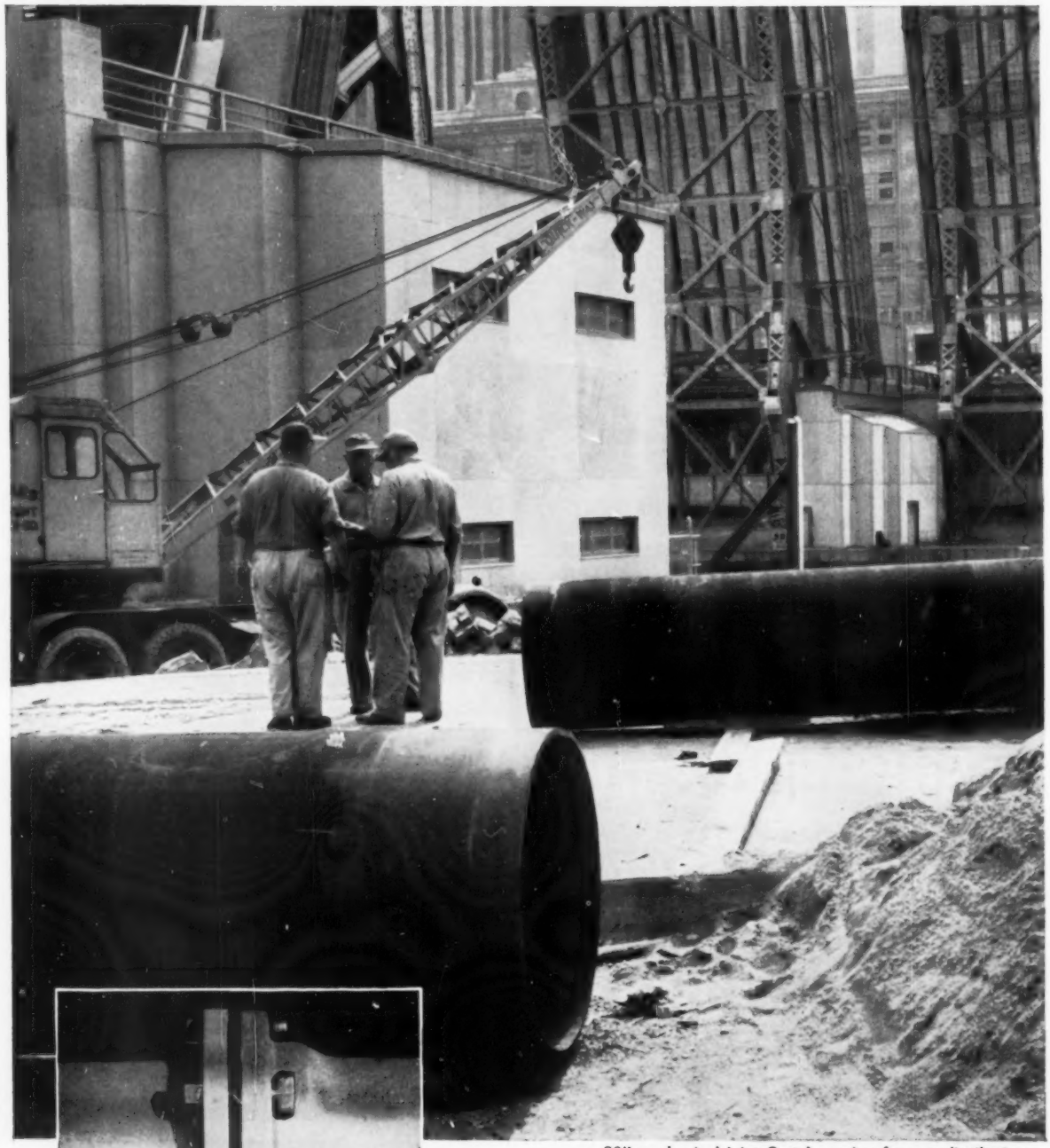

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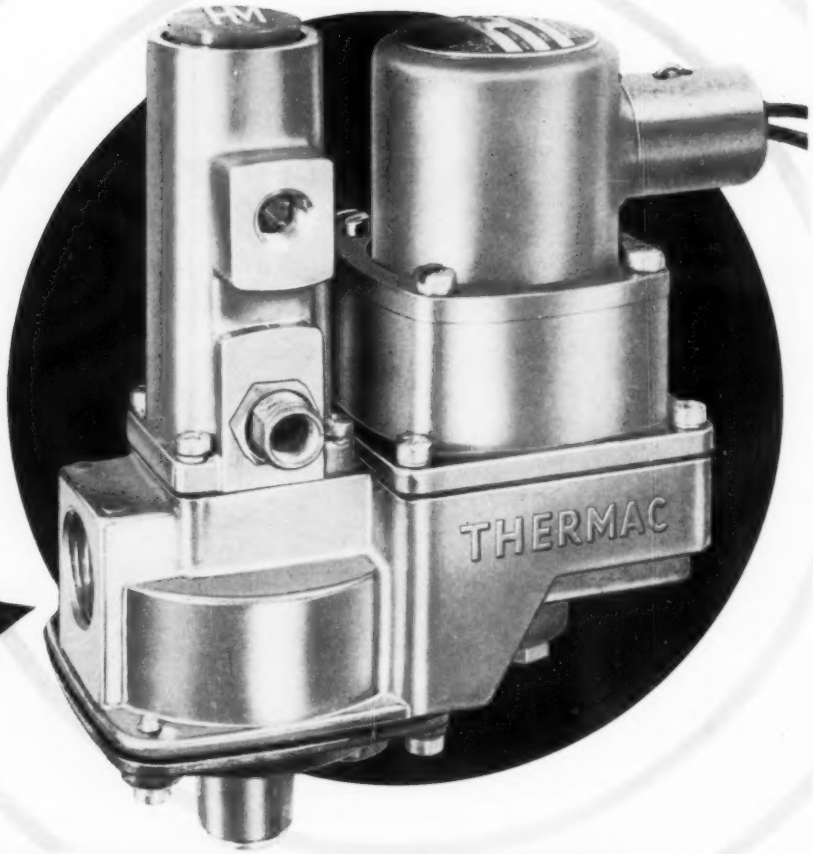

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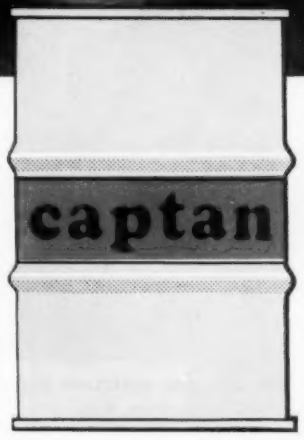

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When running service lines under roads and streets, auger drill deflection caused by fluctuations in air pressure can be a costly problem. On the work here pictured (tunneling 3" holes under 25' pavement, in sand, limestone and blue rock) deflection had formerly made it necessary to drill 2 to 3 times to complete each hole.

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"*We change oil in the compressor unit every 500 hours and every 100 hours in the engine. No oil is added between changes. We average 2 gallons of gas in 8 hours. This Jaeger has been used 550 hours and we think it is the best compressor we have ever owned.*"

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Jaeger rotaries have great advantages for utility work. Their constant pressure holds tools at top efficiency; their slower speed of operation gives you lowest fuel and upkeep costs. Full load speed in 125, 250 and 365 cfm models is only 1700 rpm and in 600 cfm models only 1650 rpm, compared with usual 1800 rpm and even as high as 2150 rpm in other makes. Two-wheel mounted 125 and 250 cfm models have full-size tool boxes, wrap-around bumpers, retractable pneumatic tired third wheel, spring-loaded towing eye and 8-hour fuel tanks as standard equipment.

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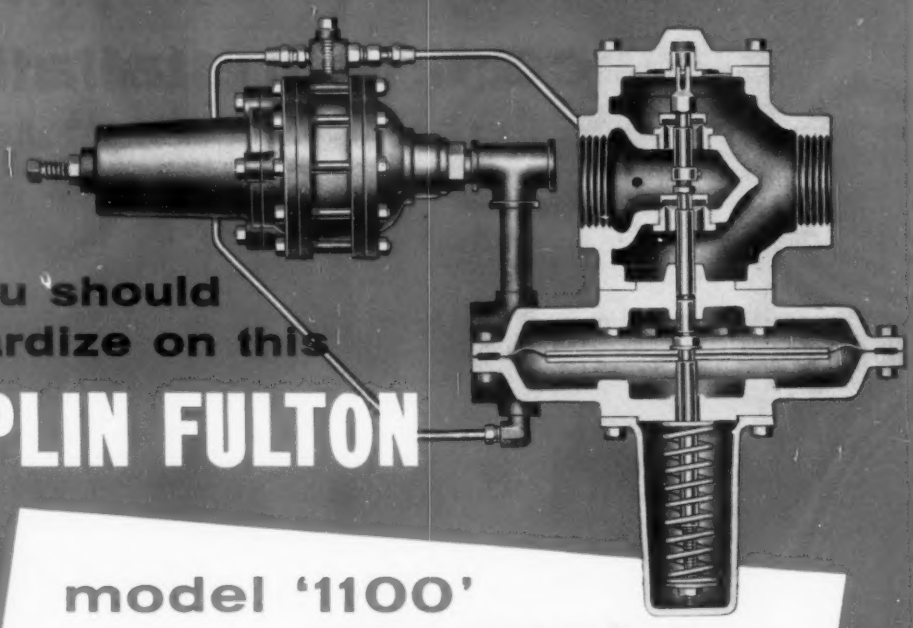

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Inlet Max.—400 psi. Outlet Range 1" to 150 psi. Size—2" only, screwed, flanged 125 or 250 ASA

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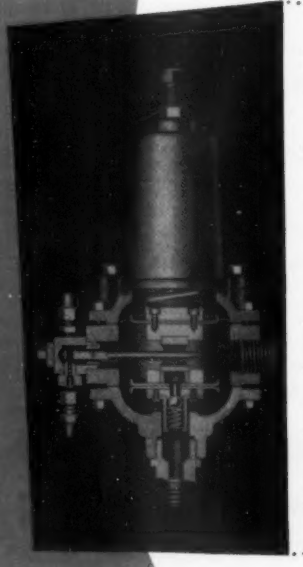

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TYPE 51 VARIABLE PRESSURE PILOT

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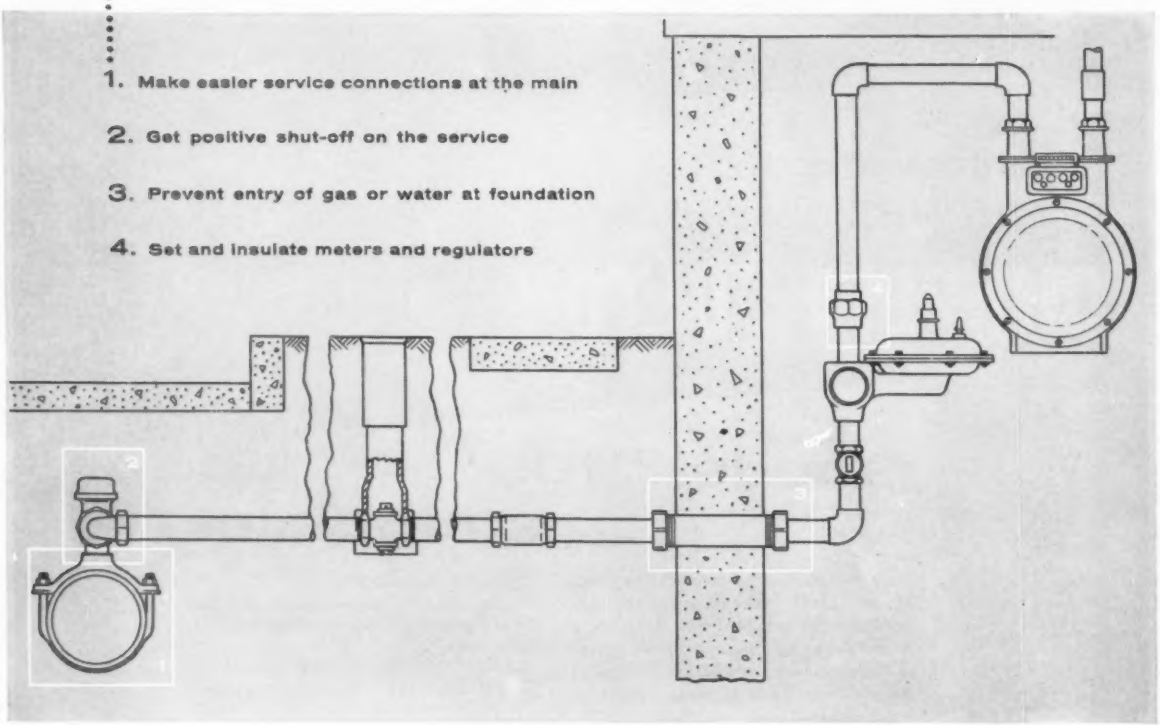
Four ways to simplify service line installations:


1. Make easier service connections at the main
2. Get positive shut-off on the service
3. Prevent entry of gas or water at foundation
4. Set and insulate meters and regulators

1. Make service connections at the main

NEW STYLE 91 SERVICE SADDLE gives you a quicker way to make permanent connections on steel or cast-iron pipe. High tensile steel straps conform snugly to the outside of the pipe; broad bearing surface prevents cutting or crushing. Available with single or double strap, tap size up to 2-inches.

2. Get positive shut-off on the service

NEW STYLE 90 CONVERTIBLE TEE (shown above with 90° Street Ell as a swing joint) serves both as a service connection or as a safe positive shut-off on pressures up to 250 psi (or 150 psi for the malleable style). Meets ASA requirements that provision always be made for sealing off abandoned services. Furnished with either threaded end or beveled for welding.

3. Prevent entry of gas or water at foundation

NEW "WALL-SEAL"...a simple leak-proof method of sealing between the wall opening and service pipe. Simply use a threaded nipple . . . and two special Dresser compression follower nuts and wedge gaskets. Eliminates the aggravation of having to pack the space with tar, rags, etc.

4. Set meters and regulators

NEW INSULOK ADAPTER...insulates, simplifies and speeds setting of regulators and meters. Blocks harmful flow of current between house and main. Virtually tamperproof. Can be used practically anywhere on the riser, on the high or low-pressure side of regulator...indoors or out. Facilitates pre-make-up of the riser assembly in shop or truck.

Unlike welded or threaded connections, the Dresser method gives you a non-rigid service which will absorb ordinary stresses and movement without leakage or damage. Dresser® special-compound gaskets stay resilient and gas-tight for the life of the line, And regardless of the type or location of the connection, a Dresser fitting goes on faster... the only tool you need is a wrench. The complete line of Dresser service fittings includes "a product to meet every practice."

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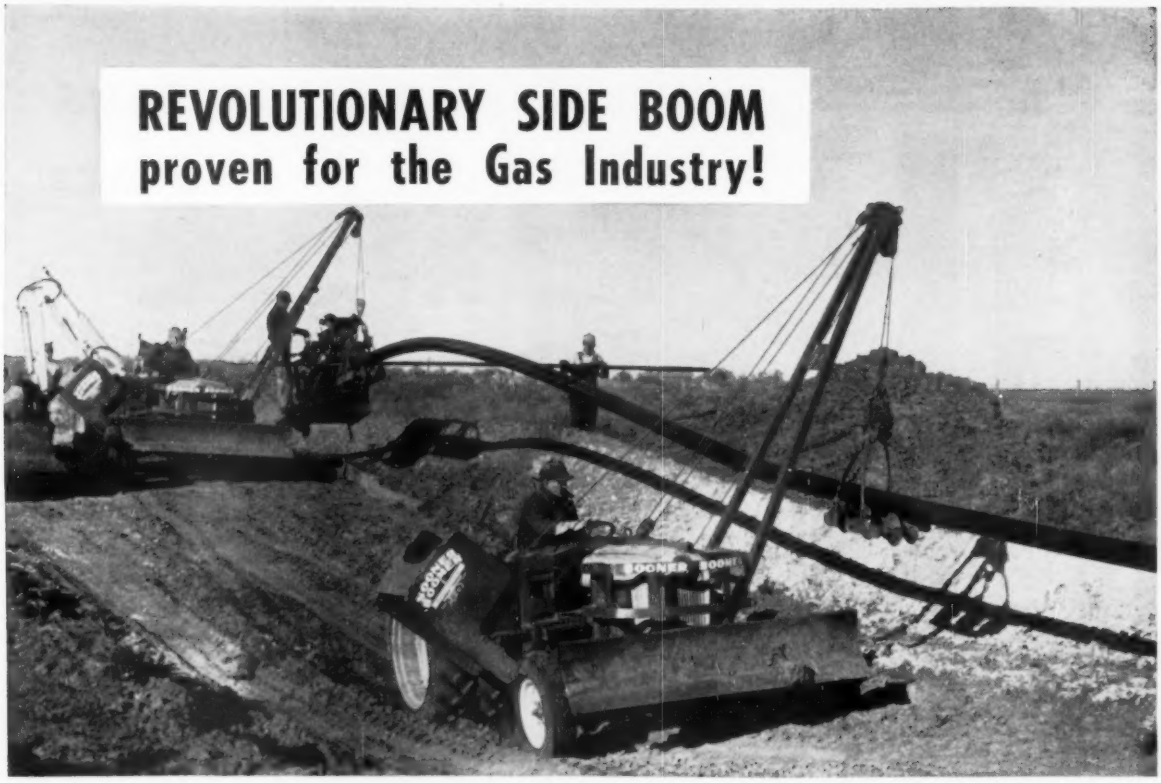

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outlet pressure tap new feature on appliance regulator*

*Maxitrol RV-31 gas appliance pressure regulator features outlet pressure tap on the top for easy pressure check (in conformance with AGA regulations for water heaters).

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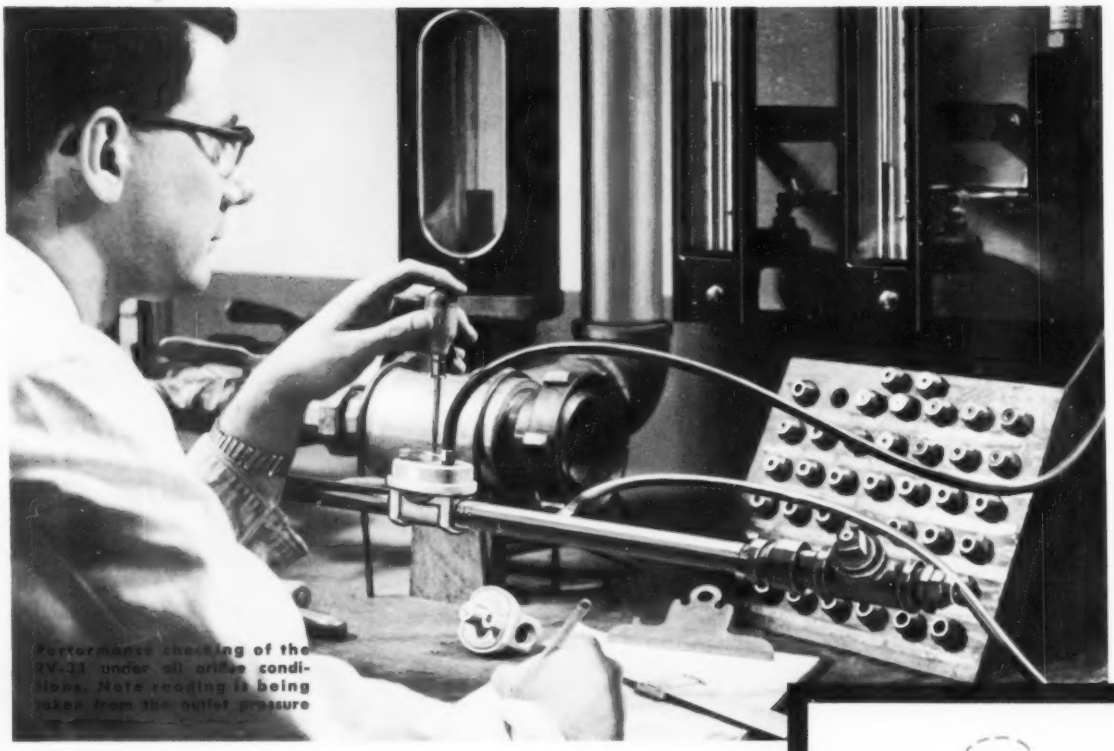


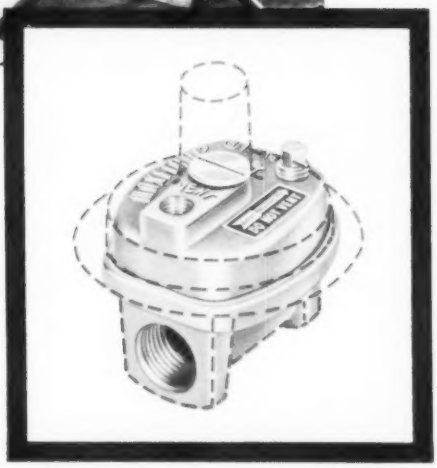
Performance checking of the RV-31 under all orifice conditions. Note reading is being taken from the outlet pressure

outlet pressure tap on top... compressed dimensions...

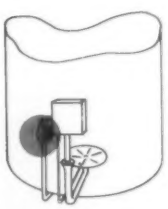
. . . with the new Maxitrol RV-31. Now water heater manufacturers have a gas appliance pressure regulator with an outlet pressure tap that is always in the right place for an easy pressure check—*on the top.*

Added to this advantage are compressed dimensions, which mean: greater design freedom for the appliance manufacturer—easier manifold servicing for the serviceman.

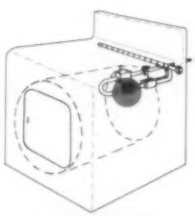
The Maxitrol RV-31 is AGA certified either for main burner load or main burner and pilot load applications. When certified for main burner and pilot load, it accurately regulates gas flows **from 120 btu. (pilot flames) to 95,000 btu/hr.**



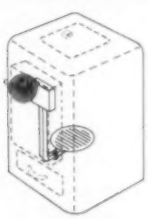
Regulator size comparisons illustrate the dimension advantages of the Maxitrol RV-31.



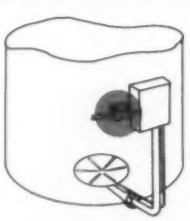
water heater



clothes dryer



incinerator



water heater

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River crossings and other underwater pipe installations present no problems when you select American Molox Ball Joint pipe. Its rugged construction adapts it to a wide variety of installation methods, and once laid, the joint remains bottle-tight under gas pressures up to 150 psi at any angle within the range of liberal deflection it provides.

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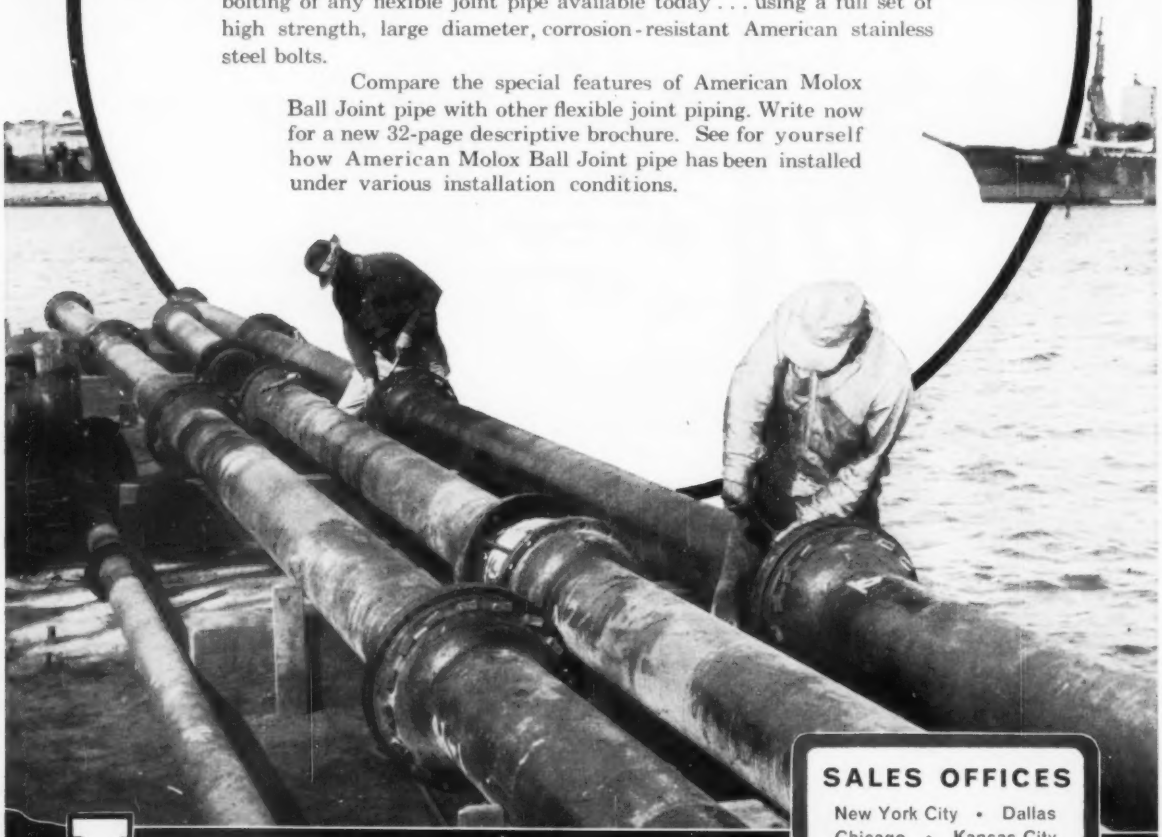

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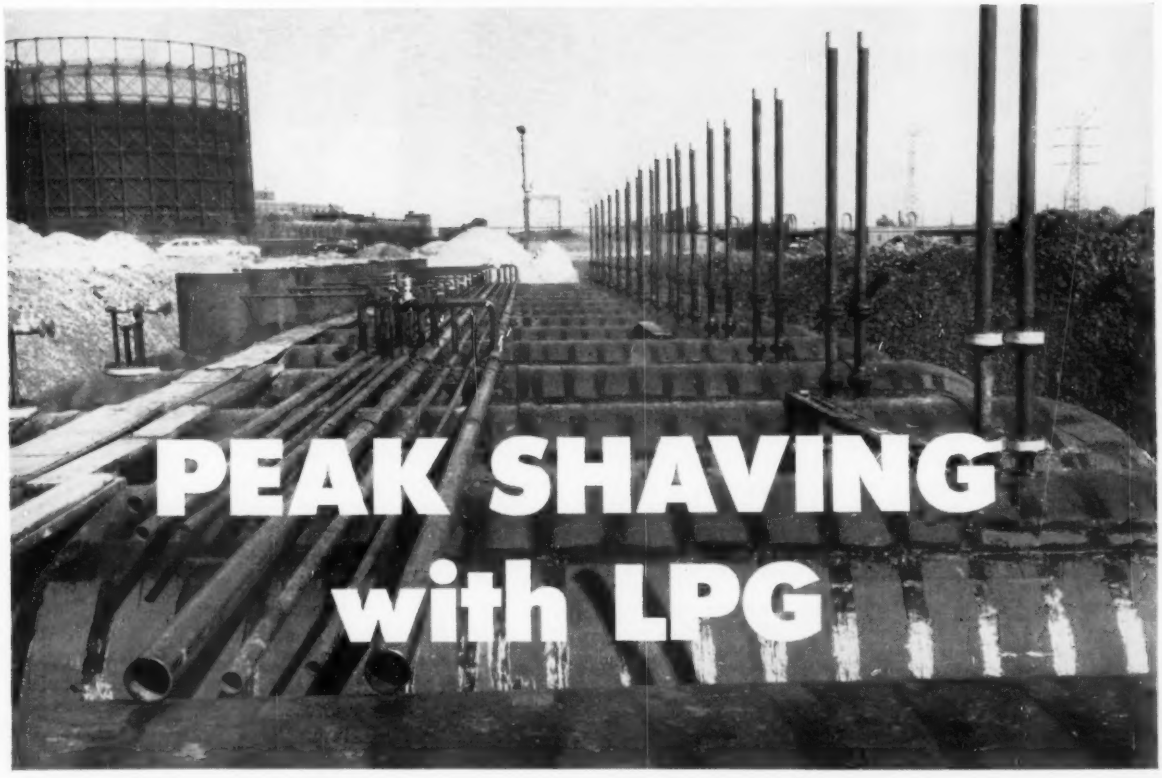


PEAK SHAVING with LPG

By JAMES K. DAWSON, Mechanical Engineer
Peoples Gas Light & Coke Co., Chicago

GAS exclusive

Fig. 1. Liquefied petroleum storage tank installation during construction at Crawford station, Chicago.

PEOPLES GAS LIGHT AND COKE CO. established, with the approval of the Illinois Commerce Commission, a 1000-Btu/cu ft sendout standard as of July 1, 1956, which required terminating its coke oven gas purchase contracts with steel companies and discontinuing the operation of the coke oven gas plant at its Crawford station. It also necessitated appliance adjustment in customers' homes.

Chicago District Pipeline Co., a subsidiary of Peoples Gas which is the link between two long-distance pipeline subsidiaries and Peoples Gas in Chicago, delivers to Peoples Gas natural gas ranging between 1025 and 1050 Btu/cu ft, and at terminal pressures approximating 150 psig at the parent company's Calumet, Crawford and North Shore avenue stations.

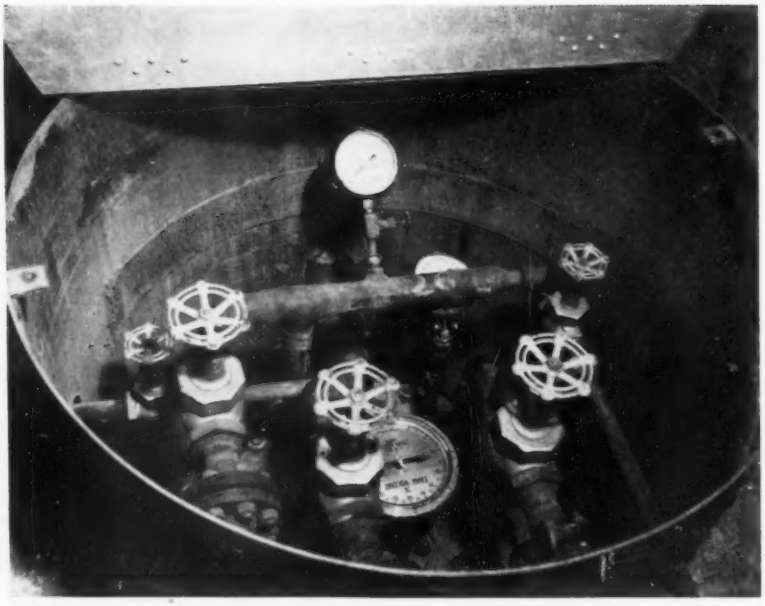


Fig. 2. Typical casing and valve arrangement on each of the storage tanks.

To standardize the natural gas to 1000 Btu/cu ft sendout, a battery of Worthington jet compressors was installed at these stations to supply the diluent air required for the Peoples Gas 25 psig distribution system. In order to assist the gas dispatching department in controlling the sendout, each battery is equipped with units ranging in natural gas capacities from 250 Mcfh to 3 MMcfh to vary the station sendout in increments of 250 Mcfh. Eight jet compressors are installed at North Shore and Crawford to give each station a total capacity of approximately 15.5 MMcfh. Seven units are installed at the Calumet Station and have a total capacity of approximately 12.5 MMcfh.

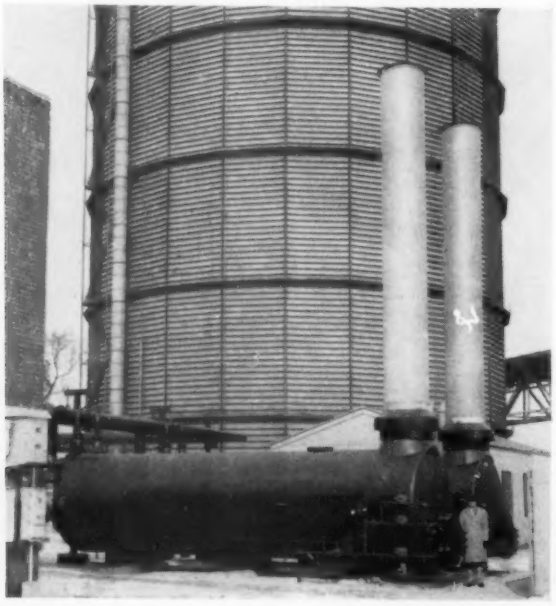


Fig. 3. Natural gas-fired indirect type L.P. vaporizers at Calumet station. Vaporizers have capacity of 10,000 gal./hr. input of 10 million Btu/hr.

L.P. gas is produced at the Calumet and Crawford stations and is used to supplement pipeline flow gas and natural gas withdrawn from the Peoples Gas System's Herscher underground storage reservoir to meet periods of peak demands.

Based on the calculations and performance tests of the utilization engineers, the following limitations were placed on L.P. production:

1. A mixture of 1000 Btu butane-air cannot exceed 20 per cent of the total station sendout for the 1000-Btu per cu ft standard.
2. A mixture of 1000-Btu propane-air cannot exceed 23 per cent of the total station sendout for the 1000-Btu per cu ft standard.

To meet the maximum day requirements at Calumet and Crawford stations, natural gas is dispatched at rates approximating 10 MMcfh. The utilization limitations permit vaporization rates approximating 25,000 gal. per hour to meet the peak shaving requirements.

Based on these limitations, additional L.P. storage and vaporization capacities were installed at the stations, including the addition of 80 30,000-gal. storage tanks and three natural gas-fired vaporizers. This increased the company's total L.P. storage capacity to approximately 3.6 million gal., evenly divided between Calumet and Crawford stations. This additional storage capacity permitted Peoples Gas to enter into contracts for L.P. deliveries of 2.5 million gal. per month for December, January and February. These contracts and additional storage capacities, when utilized in combination with the Herscher storage on a seasonal basis, supply peak shaving requirements for approximately 40,000 househeating customers.

In order to conform with the Chicago Municipal Code, the tank storage farms were buried and in-

Fig. 4. Complete LPG storage tank farm at Calumet station.

stalled in accordance with bulletin NBFU No. 59 of the National Board of Fire Underwriters. The tank farms were sectionalized into four batteries of 10 tanks each. *Fig. 1* indicates the sectionalized header under construction at the Crawford station.

Fig. 2 illustrates the typical casing and valve arrangement installed on each of the storage tanks. Volume of liquid in storage is shown on a Rochester Magnetron gauge. Additional vaporizer equipment and truck and tank car unloading facilities were installed on each project.

Fig. 3 illustrates a natural gas-fired indirect vaporizer installed at the Calumet Station. Each of these units is rated at 10 million Btu per hour or 10,000 gal. of L.P. per hour.

Fig. 1, 2 and 3 were taken during the installation of the 80 additional tanks. *Fig. 4* shows the completed tank farm at Calumet station. Since both installations are similar, the rest of the article will describe facilities at the Crawford station.

Fig. 5 is a flow diagram of the Crawford station. This flow diagram indicates the battery of jets normally used to standardize natural gas to the 25 psig distribution system.

The Btu is controlled by maintaining the required suction pressure to the battery of jets by means of a calorimeter and a calorimixer, utilized in combination, to position the butterfly valve in the air inlet header.

Fig. 6 pictures a typical jet compressor installation. The building shown in the left background houses the air filters and the calorific regulators, which are controlled remotely from the calorimeter and calorimixer located in another building. Each of the jets is equipped with natural gas-operated plug valves installed on the natural gas and air inlet connections. These can be remotely operated from an instrument panel located on the operating floor of the compressor building.

The flow diagram (*Fig. 5*) also indicates a normal tank storage farm complete with liquid unloading lines, liquid supply lines, vapor lines, and repressuring lines. The new storage tank farm is sectionalized into four batteries of 10 30,000-gal. tanks each. Two additional batteries, one consisting of 14 15,000-gal. tanks and one consisting of 20 30,000-gal. tanks are interconnected with the new system for a total L.P. storage of approximately 1.8 million gal. A 12-tank car, double track unloading system has been installed to provide for large railroad shipments to meet our present contracts. Truck unloading stations also have been installed.

Also indicated on the flow diagram is a battery of 340 Btu jets which is utilized to supply diluent gas for the control of L.P. vapors to the 1000-Btu/cu ft sendout standard. Also, two 4000-hp and one 3000-hp motor-driven centrifugal compressors are available for pumping the 340 Btu gas together with any 1050 Btu oil-gas required to meet the station sendout into the discharge header of the jet compressors. In addition, a 15 million Btu per hour natural gas-fired indirect heater is used to vaporize L.P. gas for production.

This station also utilizes two steam vaporizers having a combined capacity of 17 million Btu per hour to vaporize additional L.P. gas as required by the sendout.

As shown on the flow diagram, the sample point for sendout calorimetric control has been located a sufficient distance downstream of the L.P. vapor connection to insure good mixing of the gases from the turbulent flow of the sendout through fittings and discharge piping.

Natural gas available at 150 psig is utilized to repressure the tank cars for unloading, and also to move the liquid approximately 3000 ft from the storage tank site to the vaporizers. Each vaporizer is equipped with an automatic control system which permits the operator to set any flow rate desired from an instrument panel located on the operating floor of the compressor building. A portion of the instrument panel utilized in the operation of the

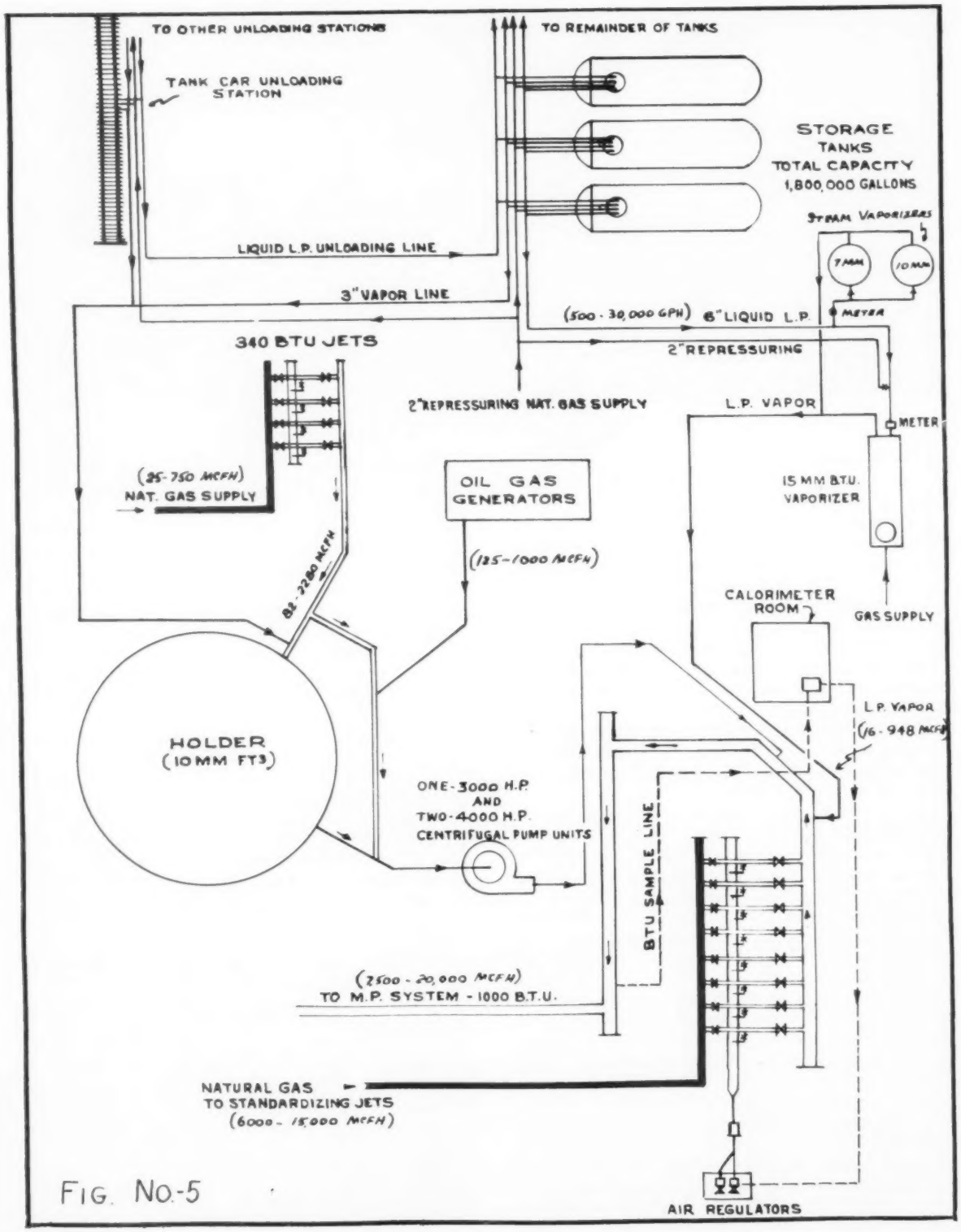


Fig. 5. Flow diagram, L.P. utilization at Crawford station.

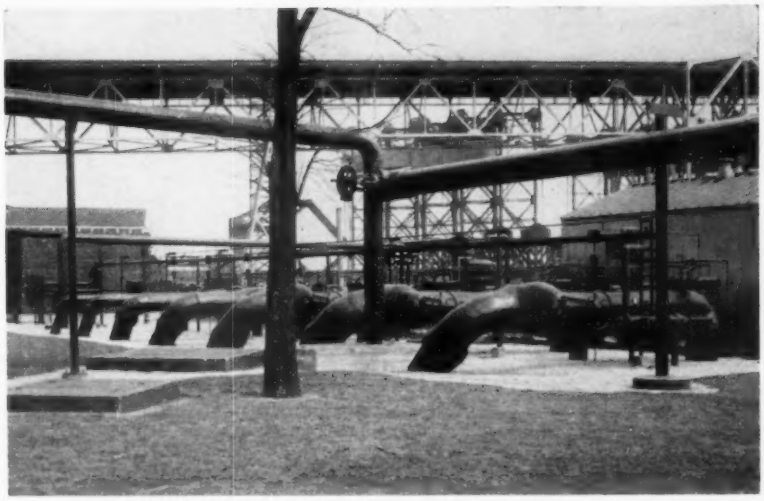


Fig. 6. Typical battery of standardizing jets at Calumet station.

station is shown on *Fig. 7*. The operation of the natural gas-fired vaporizers will be discussed later.

The large volume L.P. contracts of Peoples Gas specify a minimum delivery of 2.5 million gal. per month of either propane or butane during December, January and February. During the past winter's operation, the deliveries have been 100 per cent butane, and vaporization rates varied from 1000 to 15,000 gal. per hour at the Crawford station.

Assuming that the gas dispatching department has requested the vaporization of butane at a rate of 10,000 gal. per hour, the plant operators will pressurize a battery of 10 storage tanks with natural gas of sufficient pressure to move the L.P. approximately 3000 ft to hold a minimum pressure of 50 psig at the inlet control valves to the vaporizing equipment. The operators will then set the control equipment from the instrument panel to establish a flow rate of 10,000 gal. per hour through the vaporizers and into the discharge header of the jet compressor.

Standardizing jet compressors (Worthington) were designed to control a 1060 Btu/cu ft motive gas at 115 psig nozzle pressure to a 1000 Btu/cu ft discharge against 40 psig discharge pressure with an air inlet pressure of 12.5 psia.

Fig. 8 illustrates the performance of a typical jet compressor with 115 psig nozzle pressure. This performance curve indicates that the effluent or discharge heat value will vary between 965 Btu and 1060 Btu/cu ft dependent upon the air suction pressure to the jet compressors. This performance curve also indicates that the inlet capacity and Btu will remain constant at a fixed air suction pressure for all discharge pressures not exceeding the 40 psig break pressure. By throttling the natural gas inlet pressure from 115 psig to 70 psig, the quantity of natural gas is reduced in a direct ratio with the absolute inlet nozzle pressure while the suction inlet volume

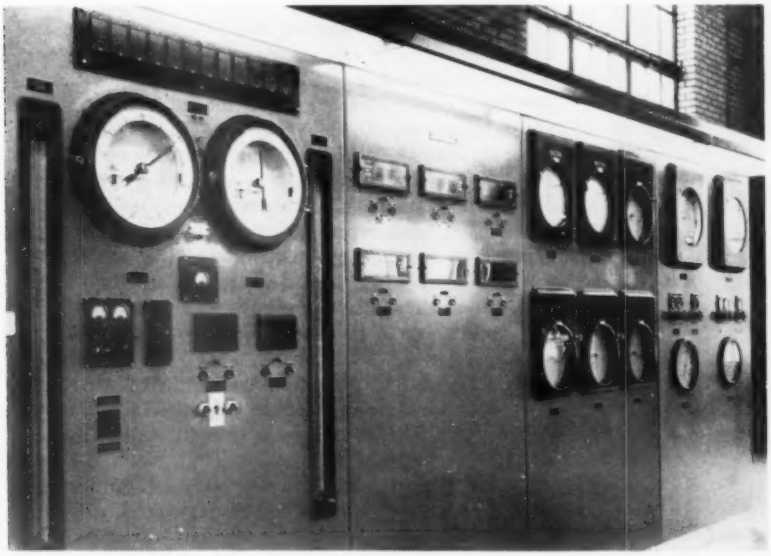


Fig. 7. Instrument panel at Crawford station.

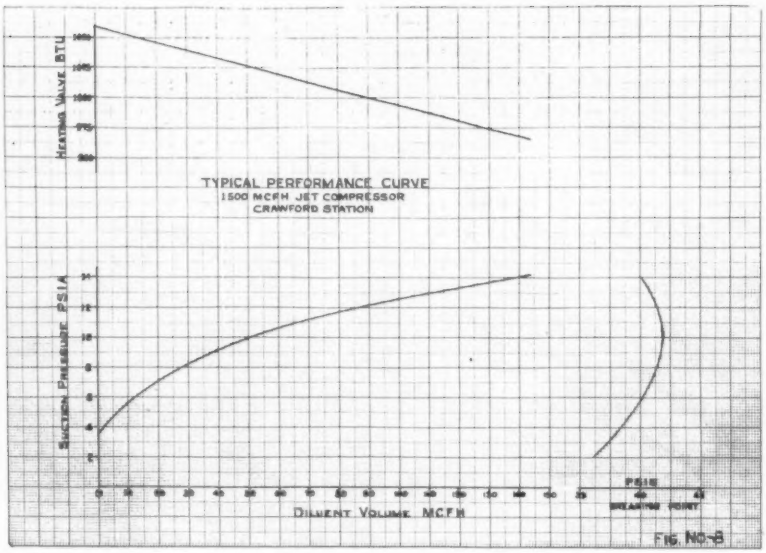


Fig. 8. Typical performance curve, 1500 Mcfh jet compressor, Crawford station.

remains approximately constant, and the break point pressure is reduced from 40 psig to 25 psig discharge pressure.

By throttling the natural gas inlet pressure of the jet compressors, it is possible to meet the pressure demands of the 25 psig distribution system to supply air to bring the natural gas to 1000 Btu, and to supply sufficient air to dilute the butane vapors to 1000 Btu at rates of 1000 gal. per hour per MMcfh of natural gas flowing through the jets.

On days of maximum L.P. production, natural gas is usually available at flow rates approximating 10 MMcfh.

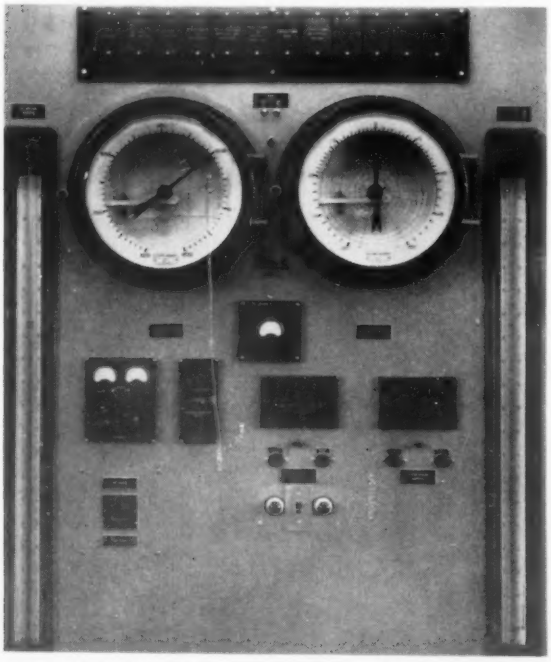


Fig. 9. Calorific sendout control at Crawford station.

By utilizing a reduced motive pressure to the battery of jets, it is possible to vaporize butane at the rate of 10,000 gal. per hour and control the total station sendout to the 1000 Btu/cu ft standard. This procedure eliminates the use of additional horsepower which would be required to pump the diluent gas for all production rates between 1000 and 10,000 gal. per hour of butane. When rates in excess of 10,000 gal. per hour are required to meet the sendout of the station, the additional diluent gas is supplied by means of the 340 Btu jet compressors (*see Fig. 5*). The required quantity of 340 Btu gas, together with any oil-gas production which may be required, is pumped by means of a centrifugal compressor into the discharge header of the jet compressors where it is mixed with the effluent gas from the standardizing jets, and the L.P. gas from the vaporizers.

The above mixture of gases is controlled to the required 1000 Btu/cu ft by means of the calorimeter and the calorimixer positioning the butterfly valves at the air inlet header of the jet compressors (*see Fig. 5*).

To facilitate the control and dispatching of the 340 Btu gas, a mercury manometer indicating the absolute pressure in the suction header is installed on the instrument panel of the compressor house (*Fig. 9*). This manometer is used as a guide to indicate the 340 Btu gas requirements during plant operation. If the suction header pressure to the standardizing jets approaches atmospheric pressure, additional 340 Btu gas will be required to maintain the 1000 Btu standard. When the suction pressure to the standardizing jets approaches 6 psia, the quantity of 340 Btu gas must be reduced.

To obtain good control of the sendout, the suction pressure should range between 8 and 13 psia when utilizing the 340 Btu jets to supply the additional diluent gas required.

During the past winter's operation, L.P. was utilized at Crawford station on 40 days during December, January and February. On only three of these

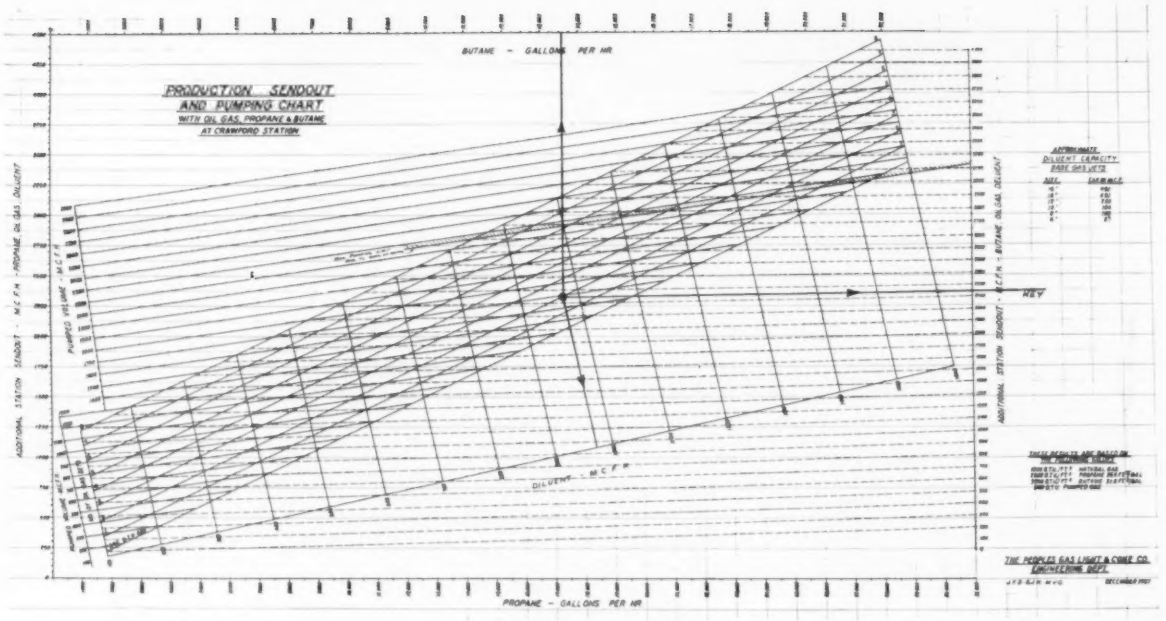


Fig. 10. Production sendout and pumping chart at Crawford station.

days, the system requirements demanded the use of the 340 Btu jets to supply the diluent gas requirements. Therefore, the procedure of utilizing the standardizing jets to supply diluent gas for the control of L.P. showed a considerable savings in pumping costs for the past winter's operation.

To assist gas dispatching and station operators, a chart has been prepared to determine the diluent gas requirements for enriching various amounts of L.P. liquids, natural gas, and oil-gas needed to meet the peak shaving demand (*see Fig. 10*).

A key is incorporated on the chart to show one possible solution of the requirements for additional sendout over and above that supplied by the standardizing jet compressors. The key indicates a solution for the requirements of an additional sendout of 2150 Mcfh. This demand could be met by the combined production from two oil-gas sets, vaporization of butane at the rate of 13,500 gal. per hour, and an air supply of 975 Mcfh, which would be produced by the 340 Btu jets. This demand will require the use of two 16-in. 340 Btu jets to entrain 982 Mcfh of air and to effect good control of the sendout Btu.

An alternate solution with no oil-gas production would require the vaporization of butane at the rate of approximately 15,500 gal. per hour, and air at the rate of 1100 Mcfh to meet the 2150 Mcfh demand. This would require the operation of two 16-in., and one 12-in. 340 Btu jets to effect good control of the sendout Btu.

The installation of a battery of 340 Btu jet compressors to supply the diluent gas requirements in excess of those supplied by the standardizing jet compressors is motivated for safe mixing operation.

These jets were designed to produce a mixture of natural gas and air at 340 Btu/cu ft at a discharge pressure of 40 in. wc when utilizing natural gas of 1045 Btu/cu ft, and at 115 psig nozzle pressure as a motive fluid. This battery of jets incorporates units varying in capacity from 60 Mcfh to 491 Mcfh in order to produce the required amount of diluent for various L.P. flow rates.

The 340 Btu mixture is approximately 200 per cent in excess of an explosive mixture of natural gas and air. The performance characteristics of these jets are such that with a loss of natural gas motive pressure, the jets will always produce an effluent mixture of natural gas and air above the explosive limit.

The production of this 340 Btu gas required by system demands will necessitate the pumping of an additional 30 per cent of natural gas. However, compared with an air compressor and a butane mixture installation complete with surge tank, two-legged mixer and controls, the horsepower requirements for pumping the 340 Btu gas exceeded that of straight air compression by only 10 per cent. This results from the higher ratio of compression required by the operation of the air compressors when pumping air through the surge tank and flow control valves into a 25-pound transmission system. The safety feature in both the production and mixing of the 340 Btu gas more than offsets the 10 per cent excess horsepower requirements.

As previously illustrated, the production of 340 Btu gas was required for approximately 10 per cent of the winter's operation of the L.P. plant. The standardizing jet compressors supplied diluent for 90 per cent of the L.P. production which represents a considerable saving on pumping costs.

Fig. 11 illustrates a flow diagram for the natural gas-fired L.P. vaporizers. This unit consists of the Black, Sivalls & Bryson indirect heater composed of a combustion chamber, heat exchange tubes and a stack, together with five pancake L.P. heat exchange

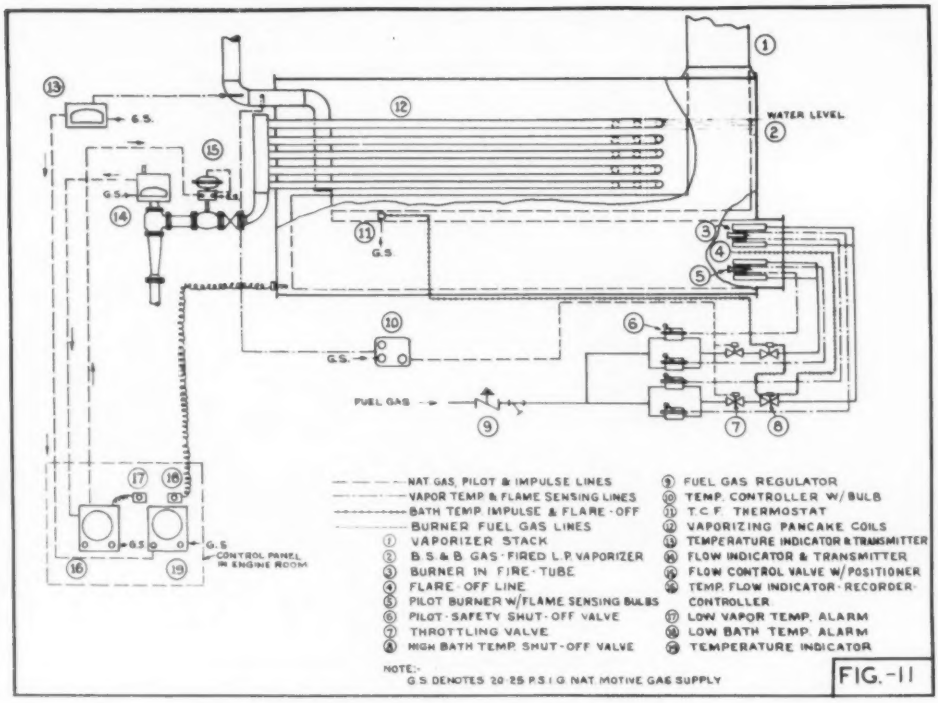

WATER LEVEL
G.S.
FUEL GAS
CONTROL PANEL IN ENGINE ROOM
NAT. GAS, PILOT & IMPULSE LINES
VAPOR TEMP. & FLAME SENSING LINES
BATH TEMP. IMPULSE & FLARE-OFF
BURNER FUEL GAS LINES
1 VAPORIZER STACK
2 B.S.&B. GAS-FIRED L.P. VAPORIZER
3 BURNER IN FIRE-TUBE
4 FLARE-OFF LINE
5 PILOT BURNER W/FLAME SENSING BULBS
6 PILOT-SAFETY SHUT-OFF VALVE
7 THROTTLING VALVE
8 HIGH BATH TEMP. SHUT-OFF VALVE
9 FUEL GAS REGULATOR
10 TEMP. CONTROLLER W/BULB
11 T.C.F. THERMOSTAT
12 VAPORIZING PANCAKE COILS
13 TEMPERATURE INDICATOR & TRANSMITTER
14 FLOW INDICATOR & TRANSMITTER
15 FLOW CONTROL VALVE W/POSITIONER
16 TEMP. FLOW INDICATOR-RECORDER-CONTROLLER
17 LOW VAPOR TEMP. ALARM
18 LOW BATH TEMP. ALARM
19 TEMPERATURE INDICATOR
NOTE:-
G.S. DENOTES 20-25 P.S.I.G. NAT. MOTIVE GAS SUPPLY
FIG.-11

Fig. 11. Control system on gas-fired L.P. vaporizer.

coils. All are submerged in a bath of water and in an enclosed housing of adequate pressure design.

This vaporizer is fired with natural gas to maintain a 145°F bath temperature. A pneumatic fuel-gas control system utilizes 20 to 25 lb of natural gas pressure as a motive force and incorporates the necessary safety shut-off valves, throttling valves, and temperature controller with sensing elements to maintain the required vapor temperatures and bath temperatures for automatic operation of the fuel-gas system.

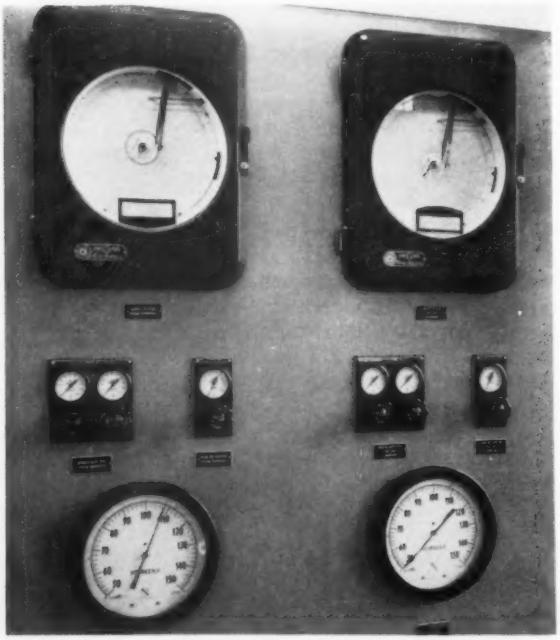


Fig. 12. L. P. flow controls for vaporizers at Crawford station.

A pneumatic control system, utilizing natural gas to eliminate the possibility of freezing, is installed on the liquid side of the vaporizers. This system utilizes a flow rator equipped with a transmitter as a sensing device which is supervised by control instruments to operate a flow control valve installed in the liquid line to the vaporizers.

A distant flow recorder, temperature indicator, and transmitter controller are mounted on the instrument panel in the engine room to allow the operators to set any desired flow rate for the vaporization of L.P. (*Fig. 12*).

Also included on the instrument panel is a low bath temperature alarm and a low vapor temperature alarm to allow the operators full supervision and control of the L.P. system.

To summarize, the equipment used at this production station is as follows: a 1.8 million-gal. storage field, two steam vaporizers, one natural gas-fired vaporizer, a battery of 340 Btu jets, three centrifugal pumping units, a liquid flow control system on the vaporizers, and a battery of standardizing jet compressors which also supply sufficient diluent gas for most of the production and control of L.P. to the 1000 Btu cu ft sendout standard of Peoples Gas.

J. F. Pritchard & Co., Kansas City, Mo., designed the plant facilities at Calumet and Crawford stations that were installed last year. ■

AUTOMATION SYMPOSIUM

A PRELIMINARY REPORT ON GAS' RECENT NEW YORK CITY SYMPOSIUM

From left: James F. Bell (Portland Gas & Coke Co.), Fred Deutsch (B-I-F Industries), Howard J. Evans (Rockwell Manufacturing Co.).

AUTOMATION in gas industry operations—1958

By J. FRED EBDON, Editor

MAN is best equipped to *think*. He can use his brain to invent, modulate, and make decisions. This ability to reason and to lend human touch to devices and mechanisms is with man when conditions are normal and off-normal. The gas industry should use men to produce efficiency of design, to study and solve problems, to apply controls and mechanisms to operations, and to use their ingenuity and logic in times of emergency. Use men in the gas industry to *think*—not to telephone in bits of information, to turn valves, to start engines, and to keep installations from wrecking themselves through manual manipulations.

That is one of the many important hypotheses and concepts developed during *GAS* Magazine's Sympo-

E. F. Trunk (Laclede Gas Co.), M. Anuskiewicz Jr. (Brooklyn Union Gas Co.), J. Fred Ebdon (GAS).

SYMPOSIUM PARTICIPANTS

M. Anuskiewicz, Jr.—Engineer of Development and Planning, The Brooklyn Union Gas Company (176 Remsen St., Brooklyn 1, N. Y.)
James F. Bell—Executive Vice President, Northwest Natural Gas Co. (Public Service Building, Portland 4, Ore.)
Gilbert Bowman—Manager of Research and Promotion, GAS Magazine (198 South Alvarado St., Los Angeles 57, Calif.)
Dave Breslauer—Technical Representative of Barton Instrument Corp. (J. Arthur Moore Co., New York, N. Y.)
Frank Chapman—Publisher, GAS Magazine (Los Angeles, Calif.)
William W. Clark—Eastern Editor, GAS Magazine (Chestnut & 56th Streets, Philadelphia 39, Pa.)
David P. Corkill—Electrical Engineer, Northern Natural Gas Company (2223 Dodge Street, Omaha 1, Neb.)
J. R. Daneker—Product Engineer, Builders-Providence, Inc., Division of B-I-F Industries, Inc., (345 Harris Ave., Providence 1, R. I.)
Fred W. Deutsch—Sales Manager of Standard & Engineered Products, Builders-Providence, Inc., Division of B-I-F Industries, Inc. (345 Harris Ave., Providence 1, R. I.)
Fred Ebdon—Editor, GAS Magazine (Los Angeles, Calif.)
Howard J. Evans—Chief Engineer, Meter & Valve Division, Rockwell Manufacturing Co. (400 North Lexington Ave., Pittsburgh 8, Pa.)
R. J. Fichthorn—Supervisor, Microwave Sales, Kellogg Switchboard & Supply Co., Division of International Telephone & Telegraph Corp. (100 Kingsland Road, Clifton, N. J.)
A. A. Gandolph—District Sales Engineer, Automatic Electric Sales Corp. (21 East 40th St., New York 16, N. Y.)
James F. Gary—Vice President, Operations, Washington Natural Gas Company (1507 Fourth Ave., Seattle 11, Wash.)
E. N. Hayes, Jr.—Sales Engineer, The Foxboro Company (Foxboro, Mass.)
Raymond E. Jacobson — Director of Marketing, Thompson - R a m o - Wooldridge Products, Inc. (5500 West El Segundo Blvd., Los Angeles 45, Calif.)
Duane V. Kniebes—Assistant Research Director, Institute of Gas Technology (17 West 34th St., Technology Center, Chicago 16, Ill.)
Howard L. Ledeen — Vice President, Ledeen Inc. (Gilman Road & Garvey Ave., El Monte, Calif.)
F. Vinton Long—Chief Telecontrol and Communications Engineer, Texas Eastern Transmission Corp. (Texas Eastern Building, Shreveport, La.)
R. C. Moore—Application Engineer, Analyzer Section, The Standard Electric Time Co. (Springfield 2, Mass.)
Bernard Mushinsky—Sales Technical Representative, ElectroData, Division of Burroughs Corp. (10 East 40th St., New York 16, N. Y.)
Bernard F. Osbahr—Editor, Electronic Industries (Chestnut & 56th Streets, Philadelphia 39, Pa.)
Abe Propper—Sales Engineer, Hammarlund Manufacturing Co. (460 West 34th Street, New York 1, N. Y.)
W. E. Rufleth—Manager, Telemetering Systems Applications, The Bristol Co. (Waterbury 20, Conn.)
E. F. Trunk — Chief Engineer, Laclede Gas Co. (3950 Forest Park, St. Louis 8, Mo.)
F. M. Van Deventer—Pipe Line Valve Consultant, Walworth Co. (750 Third Ave., New York 17, N. Y.)
Norman Wagoner — Sales Coordinator, Hammarlund Manufacturing Co. (460 West 34th St., New York 1, N. Y.)
K. W. White—Engineer-in-Charge, Valve & Regulator Department, Ingersoll-Rand Co. (Painted Post, N. J.)
Richard L. DeMuesy—District Representative, GAS Magazine (Suite 418, 360 North Michigan Ave., Chicago 1, Ill.)
Richard Duffy—District Representative, GAS Magazine (930 B. F. Keith Bldg., 1621 Euclid Ave., Cleveland 15, Ohio).
Frank J. Enright — District Representative, GAS Magazine (930 B. F. Keith Bldg., 1621 Euclid Ave., Cleveland 15, Ohio).
Joseph R. Geryk — District Representative, GAS Magazine (100 East 42nd St., New York 17, N. Y.).
Jack Kay—District Representative, GAS Magazine (198 South Alvarado St., Los Angeles 57, Calif.)
Harold J. Mott—District Representative, GAS Magazine (189 Meadows Bldg., Expressway at Milton St., Dallas, Texas).

sium, "Automation in Gas Industry Operations." The dinner-discussion meeting was held in the evening of May 7, at the Biltmore hotel in New York City. It was unquestionably informal. It was a meeting where experts and the uninitiated met for interchange of ideas on the subject under conditions of—we think—pleasurable fellowship.

The group touched on the philosophy of automation as a word. Semantics entered the discussion. It was established that most of the people present preferred not to use the word "automation" when applied to the dynamic control and remote reporting techniques in use within gas system operations. Rather, the terms "telecontrol" and "cybernetics" were better suited—both phonetically and semantically. Telecontrol was used to generally define the art of control from a distance. Cybernetics was chosen as the specific term for the science of applying computers or logic devices with mechanical-electrical-electronic controls and communications systems in the gas industry.

Dave Breslauer (J. Arthur Moore Co.), James F. Gary (Washington Natural Gas Co.).

An important tone or theme of the pace our gas industry sets in the area of telecontrol-cybernetics was produced early in the meeting. One of the panel members mentioned the high degree of automation he had found in the chemical processing, petroleum refining, and cement manufacturing industries. In a somewhat rebuttal mood, James F. Bell, executive vice president, Northwest Natural Gas Co. (formerly Portland Gas & Coke Co.), had this to say . . .

"I'd like to take just a minute and try to be a little bit brash, and set the gas industry, as I see it, in comparison with other industries . . . particularly, refinery process work. We in gas industry operations have only

Joseph R. Geryk (GAS), F. M. Van Deventer (Walworth Co.), David Corkill (Northern Natural Gas Co.), J. R. Daneker (B-I-F Industries).

one product. We don't have any problems of product mix at all.

"We have, in essence, a continuous pneumatic system from the end customer's burner tip to the bottom of the production well, which, if we designed a system large enough physically, would automatically take care of itself. As the pressure went down on someone's burner tip, the transmission would be slow, but the pressure drop would go back to the bottom of a well miles away in the natural gas fields. And it would flow a little longer.

"In the way of span of controls from the production of the raw material to the final sales point, I think the gas industry is by far the most sophisticated in automation of any industry in the world today. We may not appreciate that. But I think it really is.

"Things that Vint (Vinton Long, Texas Eastern Gas Transmission Corp.) is talking about (gas pipeline telecontrol. Ed.), and so on, are replacing this slow 20-mph travel of the pressure impulse with the speed of light. I'm convinced myself that the main objective we're after, since we have because of this automation, tremendous high capital investment—I'll bet it's somewhere in excess of $200,000 per employee in the case of Texas Eastern, Vint (Vinton Long affirmed this. Ed.), and the average distribution company has probably in excess of $50,000 per employee—what we're after is speed of transmission of these control phenomena and correction, in order that we can do the same job with less capital.

"The pipelines have approached that faster than distribution systems because their variables are fewer. In any small distribution network, such as ours, we have 5000 miles of pipe—of various sizes and ages—with hundreds of thousands of inter-connections. And where we need the techniques I think that we are all talking about in the distribution business, is to get enough knowledge to improve our design to take full advantage investment-wise of this marvelously automated system that we have.

"I would argue with anyone that the sophistication of the automatic process in the gas industry is head and shoulders above any other industry that you can pick. You have some very complex controls in the refinery, but they are really just islands. You don't go clear back to the well. Nor do you go clear through to the ultimate customer in the service station. Now, in the gas industry we do, with all of these controls.

"I think we shouldn't forget that—and we should be proud of it. We're sitting way up there on top. In other words, we're going to lead the way in some refinements. We are not going to catch up with anybody."

This impressive statement was heartily endorsed by most of the group members. It was the approach they liked. From the general agreement, it was evident that the ideas and opinions were valid and current. The stage was set for a successful discussion of the subject —automation in gas industry operations.

Men from gas pipeline and distribution companies were asked to bring the symposium up to date on the state of the art of automation in their operations today. A large distribution company, for instance, is currently involved in the matter of digital computers for design engineering, network analysis, etc. In addition, this company is making marked progress with telecontrol.

It has just installed a gate station control system that is well instrumented. It operates with 350 psig inlet pressure with an initial capacity of 4 MMcf/hr. With the control equipment installed, plus one wireline circuit, the complete function of the facility is push-button operated from a remotely located dispatcher's office.

Walter Rufleth (Bristol Co.), Duane V. Kniebes (Institute of Gas Technology), R. C. Moore (Standard Electric Time Co.).

Bernard Mushinsky (ElectroDate Div., Burroughs Corp.), R. J. Fichthorn (Kellogg Switchboard & Supply Co.).

The station is a billing station. It has fogging, dehumidification, and odorization operations integrated. Full over-pressure protection, pressure override, and gas measurement compensation have been designed into the facility. Volume can be varied over the designed 250 Mcf/hr through 4 MMcf/hr range.

The company's natural gas bill is determined by the meters at the station. Measured volume is automatically and instantaneously computed with compensation for temperature, pressure, supercompressibility, specific gravity, etc. The accuracy of the computing system has been proven in, by actual experience, and has been found to be accurate within a fraction of 1 per cent.

Bristol equipment is used for the production of the corrected "Q" gas measurement. The volume control is accomplished with Foxboro equipment, and telemetering is Hammarlund tone equipment. This automatic station has been on the line—in operation—since December 1957. It was reported that the company's operating people didn't share the confidence of the design engineers—they kept a man on the site during the past winter. But, it will probably be unattended during the coming heating season. Another station of equal capacity will be equipped with similar controls for automatic, unattended operation this year.

The dispatcher's office is the target for another application of telecontrol within this distribution company. Here, a mass of data flows in from key operating points. The dispatcher is supposed to be operating the system, but in logging and computing these data from many points, he is pressed to keep up with the paper work. Hence, the company contemplates design and installation of a data logging-selective readout system in the near future. Then, the dispatcher will dispatch, he will operate the system with complete readout available by push-buttoning the data processing system on the hour. Specific operations where trouble is suspected can be selectively pointed out at any time upon push-button command.

Ultimately, the corrected "Q" gas measurement computers at most major meter stations will be tied-in with a master computer, so the dispatcher will have a grand readout of the volume received from the several sources and holders available at any moment, any hour, or what have you.

The next step will be to get into other telecontrol functions, such as pressure control and other operations. So far, this company has progressed, in phases, into the matter of automation of incoming intelligence from key operating points in its system—figures and volumes, etc. But this is only the beginning. Its business is growing, its loads are growing, and it is taking the approach that automation permits it to keep consumers better supplied by telling as quickly as possible the state of the system in direct relation to contract obligations. With further application of faster-than-thought control techniques and data reduction devices, the company will be able to do a larger job better with basically the same number of people.

Another natural gas distributor, several thousand miles away, reported to the group members that his company is in automatic control with "both feet." Plans are developed to go as far as possible with automated operations purely on the basis of economic justification.

One of its vice presidents told *GAS'* symposium members that operations look like this: The load has grown six times, by volume, since conversion to natural gas 16 months ago. The company originally purchased firm gas and interruptible pipeline gas through the same meters. And it recently started purchase of a third type—manufactured-gas displacement service gas. This is a peak shaving service from its pipeline supplier.

Approximately 50 to 60 interruptible industrial customers were flanged-up in the first four months. This increased to 100 interruptible industrial customers by year end. They took 77 per cent of the load in the first year.

Gas in all classifications is measured by six purchase metering stations. To protect the billing demands against penalty clauses, etc., instrumentation has been installed. The intelligence-end devices cover three walls of a very large room. These are basically supplied with information by approximately 60 leased lines and include nine multiplex systems, combining as many as 15 signals on one wire.

The clerical work at this dispatch center is vexing dispatching personnel as they balance out hourly during the heating season, and every four hours in the

Norman Wagoner (Hammarlund Manufacturing Co.), Abe Propper (Hammarlund Manufacturing Co.).

A. A. Gandolph (Automatic Electric Sales Corp.), Bernard Osbahr (Electronic Industries), K. W. White (Ingersoll-Rand Co.), Raymond E. Jacobson (Thompson-Ramo-Wooldridge Products Inc.).

summer time. High-level dreaming indicates the necessity of feeding all of this operating data into a computer system that will readout at high speed, rather than continue to rely on pencil and paper work. The company thinks it could come, and this group member feels it will come.

Here is how it will look then. Weather information—currently being teletyped in—will be electronically processed along with past load data, the loads as they are occurring, etc. The logic device will be programmed to compute the interruptible load and the firm load. It will spew out forecasts of these loads for the day. Initially, it will printout peak shaving level and curtailment points. Eventually, it hopes to automate to the extent of having the computer control operation of LPG peak shaving equipment as needed and issuing curtailment orders, if and as required.

This company is going to remotely control all of its major district regulator stations. Such control is planned for all outside stations—two of which are being operated remotely from the dispatch center at this time. Two more are being instrumented and equipped for remote control.

And the company is moving in data processing of orifice meter charts, too. After charts from industrial customers are integrated, the pulled data are put on cards. IBM data processing equipment computes the volume, correcting for all factors in the orifice flow constant and computing the general orifice equation. All of the foregoing was reported as "going along fairly well."

In the final analysis, telecontrol and cybernetics will apply to this distribution company's operation's as mentioned. And they are being extended into such areas as holder filling and withdrawals, remote compressor operation, remote holder-heating operations and remote propane machine operations. Two such stations containing these facilities are now being equipped and a third is in process.

Some displacement of jobs but no layoffs has been experienced as the company works into automation. Involved personnel are shifted into other distribution sections and crews. What is being primarily prevented is adding to the payroll under expanding operations by puting in instrumentation and automatic system.

Distribution network analysis is pretty well developed in this gas utility. Design engineers make use of analog computer installations at a state university and at the Institute of Gas Technology. Because of the expense of these facilities, the company is working with IBM on development of network flow analysis by digital computers—a study that is working out well.

Natural gas pipeline companies are taking the lead in progressing toward fully automated gas systems. Remotely controlled, unattended compressor stations—both onshore and offshore—are a reality in that segment of the industry. Highly automated processing plants are nearly so. Telecontrol is fairly routine on a number of long-distance transmission lines. With the transmission companies it is not so much of a question of if we should do it now, it is more a question of how far we go with the techniques and hardware available today.

But, telecontrol and cybernetics are arts that must be mastered in steps. The only way to approach full automation of pipelines is in phases.

Naturally, the path toward operating automatic system—freeing men to make unhampered decisions and to think—has not been without problems. One of *GAS'* symposium guests told the group that some of these problems were due to "our being a little ahead of time."

His company—a major gas transmission system—feels that a pipeline system can be operated more quickly, more efficiently, more safely, and more reliably through telecontrol and cybernetics than with manual methods and the more conventional communications techniques. So his company is going ahead with automation.

Some years ago this company built a microwave radio communications system. Some difficulty with this microwave system for control purposes was experienced, but it was pioneering. The originally installed equipment and skills are not what they are today.

Now, the company has progressed to its first remotely controlled, unattended compressor station. This is a facility with three reciprocating natural gas engines and integral reciprocating compressors. Personnel have gained experience by operating it via microwave radio and leased wirelines. Panel members

were informed that " . . . it works perfectly under both conditions."

With this experience under its belt, the company plans to construct four of the largest gas-fired pipeline compressor stations in the country. They will be remotely controlled. These will be powered by gas turbine prime movers driving centrifugal compressors—a first in this company's operations.

In building these high-horsepower stations (about 13,400 hp each), the company is pioneering again. First, the installations will be a long distance from company headquarters, and second, installed horsepower being high means considerable damage can be done if the units should run out of control. But, the project is moving ahead. Design has been completed, control equipment has been contracted for, and engineers are working on the decision for type of communications links. Another station, a reciprocator, may be built on the Louisiana end of this pipeline complex.

So, this company is definitely well started in the art of telecontrol. They apply it to new constructions and, actually, every station constructed in the system since 1950 has been designed for automatic start-stop sequencing. This applies to straight reciprocating units as well as some large electric motor-powered centrifugal stations the company operates.

The speaker mentioned he is convinced that fully automatic compressor stations will be built before long. That is where the art of cybernetics comes in. An automatic station will have to take its intelligence from some central computing point. Then, running and flow data will return through feedback to the computer. These data will be assimilated along with operating condition data from key points in the pipeline system. The computer will follow its man-prepared program to process these data into control commands that will flow to the stations and produce optimum operations under the existing pipeline system state.

One of the crying needs for automatic pipeline operation at the present time is feedback data from delivery points. The breakthrough will be at hand when gas distribution companies are willing to accept the use of computing meters for billing purposes. This leading pipeline engineer feels that most distributors are willing to accept the use of electronic or mechanical, on-site computers at town border stations. Instantaneous telemetering of deliveries up and down the pipeline system will produce the source of end intelligence for the feedback system. This can be fed into the computer, and in turn, give major basis for electronically programmed decisions for compressor stations and other properties control.

It was pointed out that we really don't have a problem in this area. Our group member feels his company will work out a cooperative agreement this year with one of its distribution customers that will be willing to work with it on this instantaneous delivery concept. He said, "I think we all know what to do, we all have the knowledge, and it just takes some cooperation."

The discussion turned to comparison of communications media for gas industry control operations. The question was asked as to the desirability of leased lines or microwave radio for this function? It was astutely answered by Vinton Long, Texas Eastern Transmission Corp. He said . . .

"I think it boils down to this; you can build, if you want to pay for it, a privately owned microwave system which will give you more security for unattended compressor stations or control points than common carriers can ordinarily afford to give you. Now, that's not what you could do in 1950, or 1948 or 1947, that is what you can do today. But, it costs you money.

"It's not the fault of the common carriers, for they do a good job. But if they could go into your stations with dual equipment, then we'd have no problem at all. For, it's a dual transmission—in two opposite directions.

"The reason I feel you beat their service with a privately owned microwave system is that you can install dual equipment. This stops some of the things that happen to you now when something takes down your lines.

"Now, I'm not talking about your long-line carriers, like AT&T facilities, they've got all kinds of alternate routings. I am talking about your trunks where you are coming into your compressor stations and your points of sales. There, you're limited in your leased-line run-around."

Actually, this is just an introduction to some of the ideas developed and opinions expressed in this meeting. We have only scratched the surface in this part of the report on *GAS'* Symposium—"Automation in Gas Industry Operations." The report will continue in the August issue of *GAS*. In the next part, we will get down to the details of the subjects covered very generally here. The discussions were intriguing, searching and thought provoking. In short, due to the contributed thoughts of the gas company engineers along with components and systems manufacturers' technical people, we sincerely feel that our detailed report will be something fresh in technical trade journalism—something you will find interesting. ■

Howard L. Ledeen (Ledeen Inc.), E. N. Hayes Jr. (Foxboro Co.), Gilbert Bowman (GAS).

What the serviceman should know about . . .

GAS CLOTHES DRYER CONTROLS

By E. W. WECHSLER, Manager, Technical Sales Division
White-Rodgers Co., St. Louis

Part 1: Electric ignition controls

IN any discussions of gas-fired clothes dryers, the control systems must be broken down into two categories. There are those dryers having a completely automatic electric ignition system, and those which instead of electric ignition, incorporate a standing pilot. From the standpoint of understanding the control system, they are somewhat similar in nature, but do vary considerably in servicing. Our discussion, therefore, will be divided first into electric ignition gas dryer controls, and secondly, standing pilot systems. Electric ignition controls will be covered in this article, standing pilot systems next month.

In both systems, there may be a number of variations. Here, however, we will cover a basic system, with some mention of the variations which might be involved. If one understands this basic system, it is quite likely that he can diagnose a field problem, regardless of the dryer.

A gas-fired electric ignition dryer control system consists primarily of the following:

• Automatic Pilot

An automatic gas pilot, with some provision for electric ignition, lights the main burner. This pilot operates only when the dryer is in operation, which is the period during which a load of clothes is drying. It might also be defined as the period set by the housewife on the dryer timer. As in any other gas-fired system, the pilot is the safety means for making certain that gas cannot be passed through the main burner without ignition.

• Dual gas valve

A dual gas valve, of the solenoid type, is the second major component of the electric ignition system. This actually consists of two solenoid valves in the same gas line. The first of these valves, the one closest to the pressure regulator, controls the flow of gas to the automatic pilot. It actually provides 100 per cent shut-off. In other words, if for some reason the pilot does not ignite from the electric ignition coil, this valve, after a suitable period, will shut off the gas to the pilot, making certain that there is no gas being admitted to the dryer, either to the main burner, or to the pilot. The second solenoid in the line immediately follows this pilot solenoid, and is usually referred to as the main burner valve. It cycles under the control of the timer, the cycling thermostat, and the high temperature limit switch. Its purpose is to control the temperature in the drum of the dryer. In this connection, it senses when the clothes are dry, and shuts off the main burner preventing overheating, or possible damage of the clothes.

• Cycling thermostat

In the previous paragraph, we mentioned a cycling thermostat. This may be an adjustable thermostat covering a range of drying temperatures, or anywhere from one to three fixed setting thermostats, depending on the design of the dryer. With fixed setting thermostats, the dryer may have from one to three pushbuttons on the control panel, giving the housewife a choice of drying temperatures, depending on the type of load. They are usually snap action thermostats, either of the hydraulic action, or bimetal type. The sensing element is located in the exhaust air of the dryer. Electrically, it is wired in series with the main burner valve.

• High temperature limit switch

In addition to the cycling thermostat, there can be one or more high temperature limit switches which prevent overheating of the dryer. Such overheating can be caused by some condition, such as failure to clean out the lint trap, blocking of the duct system, or some other failure of this type. The limit may be located somewhere in the duct system, in the combustion chamber, or in close proximity to the main burner, again depending on the design of the dryer. Regardless of location, its purpose is

to shut off the main burner and pilot, if the dryer overheats. Such a high temperature limit is usually of the bimetallic type.

• Warp switch transformer

The warp switch transformer combination serves a dual purpose. First of all, the transformer supplies the proper voltage for operation of the electric ignition system, in igniting the pilot gas. In most cases, it operates under command of the timer and the pilot switch. When the pilot is energized and its electrical contacts close, the ignition transformer is switched out of the electrical circuit. The other function of the warp switch transformer combination is as a safety component. This is provided by the warp switch itself.

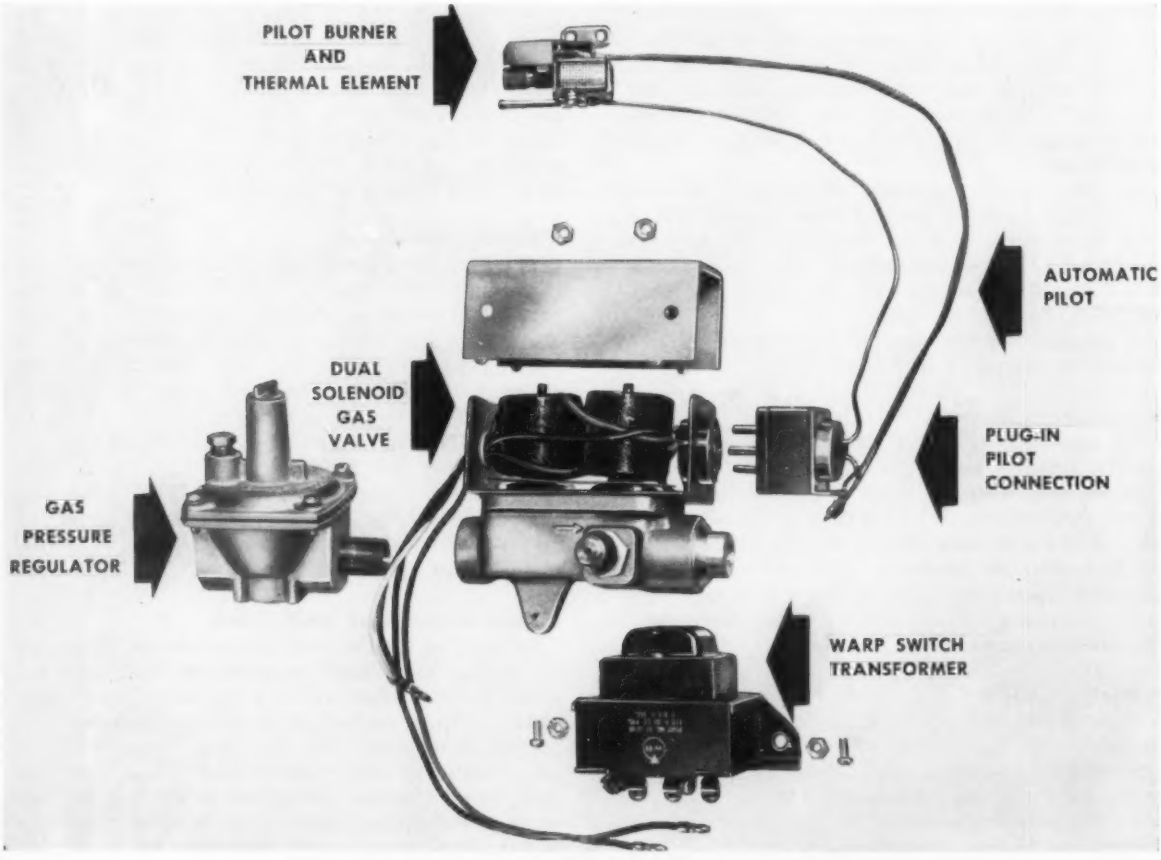
Previously, we discussed 100 per cent shut-off. The warp switch works in conjunction with the pilot valve, to make certain that the pilot gas is cut off and stays off, if for some reason the pilot does not successfully light. The warp switch is factory adjusted to give adequate time for the pilot to make a successful attempt to light. An additional function of the warp switch is to break the circuit to the electric ignition coil, if for some reason the pilot does not light. In other words, as a part of the 100 per cent shut-off function when gas is cut off to the pilot, the ignitor circuit is broken, preventing continuous operation of the ignitor, and its eventual burn-out.

• Gas pressure regulator

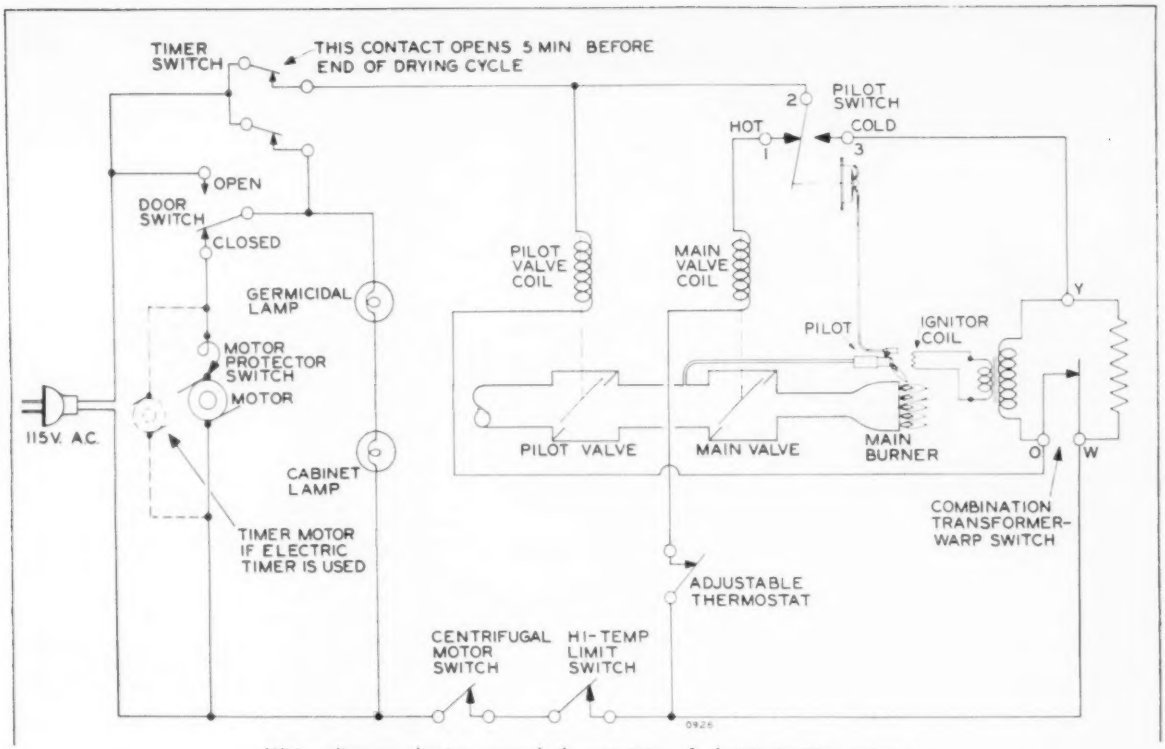
A gas pressure regulator in the manifold, or as any integral part of the dual solenoid valve casting, prior to the dual valve, but downstream from the manual "A" cock, provides even gas pressure to both the pilot and the main burner. Usually, it is factory set in the neighborhood of 3½-in. wc, giving a pressure at the burner itself of approximately 3-in. wc. The purpose of this pressure regulator is to provide a steady gas input and drying rate, regardless of fluctuation in gas pressure in different installations and geographical areas. In dryers equipped for LPG, no regulator is included in the dryer. However, there is one in the LPG tank system. LPG systems usually operate at 11-in. wc.

• Additional components

In addition to the controls outlined above, which we consider to form the main control system, a number of other electrical components serve in some way or other to complete the control system, and must necessarily be considered in servicing the gas-fired dryer. An example of this might be the door switch, the purpose of which is to shut off the main burner, and in some cases the pilot, in addition to



Components of an electrically ignited gas clothes dryer control system.



Wiring diagram showing general characteristics of electric ignition system.

stopping the drum rotation, when the door is opened during the drying cycle.

In most cases, the dryer motor includes a centrifugal switch. The purpose of this switch is to assure that the main burner cannot come on, unless the dryer motor is turning the drum at a specified speed.

The timer itself can be considered to be an integral part of the control system since through a set of cams and switches, it actually sequences the operation of the various other controls in the dryer.

Dryer control systems are predominantly line voltage, operating from a 115-v, 60-cycle inlet. This differs somewhat from various other control systems, such as found in heating or air conditioning where they operate for the most part from 25 v supplied by a transformer. The electric ignitor, however, operates from 2.5 v taken from the secondary of a 115- to 2.5-v transformer.

• Sequence of operation

In order to better understand the function of the various controls described here, it is well to have some idea of their sequence of operation, during a normal drying cycle.

A typical sequence with an electric ignition control system might be as follows:

The housewife loads the dryer and sets the thermostat, depending upon the type of load. An example of the thermostat setting might be a case where some nylons, or other synthetic materials, are to be dried. The housewife would press that particular button, or set the thermostat dial to the "Modern Fabric" setting. The timer is then set according to previous experience, or the dryer instruction book. In some cases, the timer knob itself might indicate the type of load.

This immediately completes the electrical circuit to the pilot valve solenoid. Gas passes through the pilot valve solenoid, and through the orifice of the pilot, at which time it is energized by the electric ignition coil. The pilot begins to heat. When the thermal element is sufficiently hot to energize the electric pilot switch, the main burner solenoid is energized, and the main burner supplies heat to dry the clothes. At the same time that the pilot switch closes the contacts to the main burner solenoid, it also opens a set of contacts to the electric ignition coil, as its function is now completed. The clothes will then dry until the timer runs its complete cycle, and shuts off not only the main burner, but stops the drum rotation. In most dryers, five minutes prior to the end of the time cycle, the main burner is shut off, but the drum continues to rotate and the fan operates, using up that additional heat still remaining in the dryer.

During the drying cycle, a thermostat, as explained previously, will regulate the temperature in the drum, by cycling the main burner valve. Again, as explained before, if for some reason the drum should overheat, the high temperature limit will shut off the main burner and pilot. Also, if the housewife should open the door during the drying cycle, the main burner will shut off, and the drum will stop rotating. The cycle will resume when the door is again closed.

To consider the function of the safety circuit, we

ELECTRIC IGNITION SYSTEM

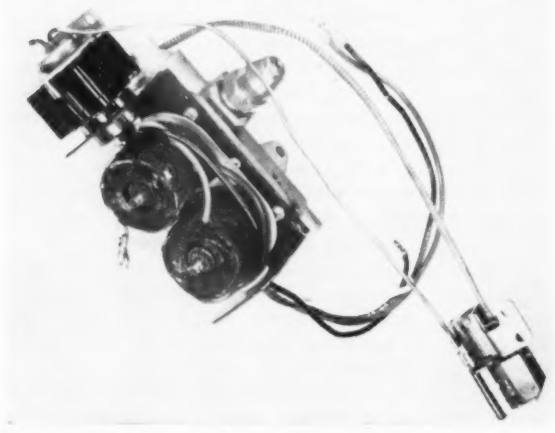
Step from cold start	OBSERVATION: Cabinet Light	Motor	Ignitor Coil	Pilot Flame	Main Burner Flame	POSSIBLE CAUSE	HOW TO CONFIRM CAUSE	POSSIBLE REMEDY
1.	Off	Not Running	Not Glowing	---	---	A. Dryer unplugged. B. Open fuse. C. Open circuit in timer.	A. Check electrical connections. B. Observe fuse. C. Check continuity thru timer contacts.	A. Restore power to dryer. B. Replace fuse. C. Clean timer contacts, or replace timer.
2.	On	Not Running	Not Glowing	---	---	A. Motor overload protector open. B. Door switch contacts open.	A. Check continuity thru motor overload protector. B. Check continuity thru door switch.	A. Replace motor overload protector. B. Replace door switch.
3.	---	Running	Not Glowing	---	---	A. Broken ignitor lead. B. Poor connection at ignitor. C. Open circuit in warp switch. D. Pilot contacts open. E. Broken ignitor. F. Open circuit in transformer. G. High temperature limit switch contacts open.	A. Check ignitor leads. B. Check ignotor terminal screws. C. Check continuity thru warp switch terminals "O" & "W". D. Check continuity thru terminals 3 & 4 on pilot switch. E. Visually inspect. F. Hold #2 cell flashlight bulb across transformer ignitor terminals. No light indicates open transformer. G. Temporarily short-out limit switch.	A. Replace ignitor leads, or ignitor assembly. B. Tighten screws. C. Replace warp switch, or warp switch-transformer. D. Replace pilot switch assembly. E. Replace ignitor assembly. F. Replace transformer, or warp switch-transformer. G. Replace limit switch.
4.	---	Running	Glowing	No	No	No or Insufficient Pilot Gas Caused By: A. Main line or pilot gas cock closed. B. Air in gas line. C. Blocked pilot orifice. D. Low gas pressure. E. Blocked pilot port. F. Open circuit to pilot valve coil.	A. Check visually. B. Attempt to light pilot manually. Blowing lighter indicates air. C. Remove and inspect orifice. D. Check pressure with manometer. Should be 3" to 3½", (11" LPG). E. Visually inspect. F. Check electrical continuity to pilot valve coil.	A. Open main line or pilot gas cock. B. Bleed air from line. C. Clean with solvent. D. Check line pressure. Notify utility if low, or replace LPG tank. E. Clean ports. F. Repair open circuit, or replace coil.
5.	---	Running	Glowing	Yes	No	Pilot Flame Insufficient To Heat Bulb Because Of: A. Low gas pressure. B. Dirty pilot orifice. C. Incorrect orifice. D. Partially blocked pilot port. E. Yellow or otherwise poor pilot flame. F. Pilot shield out of position. G. Thermal element broken or damaged.	A. Check with manometer. Should be 3" to 3½" (11" LPG). B. Remove and inspect orifice. C. Check orifice size with instruction manual. D. Visually inspect E. Visually check flame. F. Visually inspect. G. Visually inspect element.	A. Check line pressure. Notify utility if low, or replace LPG tank. B. Clean with solvent. C. Replace with proper orifice. D. Clean ports. E. Clean primary air holes, or lint screen. F. Straighten pilot shield. G. Replace pilot switch assembly or thermocouple.
6.	---	Running	Not Glowing	Yes	No	A. Open circuit in cycling thermostat, or high temperature limit. B. Open circuit in pilot switch. C. Open circuit to main burner valve coil.	A. Check electrical continuity thru thermostat and limit. B. Check continuity thru pilot switch terminals 2 & 4, with pilot lighted, and switch unplugged from valve. C. Check electrical continuity to main burner valve coil.	A. Replace thermostat or limit. B. Replace pilot switch assembly. C. Repair open circuit, or replace coil.

--- Indicates not important in observing this step.

Step from cold start	OBSERVATION					POSSIBLE CAUSE	HOW TO CONFIRM CAUSE	POSSIBLE REMEDY
	Cabinet Light	Motor	Ignitor Coil	Pilot Flame	Main Burner Flame			
7.	- - -	Running	Not Glowing	Yes	Yes. Valve chatters or cycles too often	Pilot Flame Insufficient To Heat Bulb Because: A through F in #5 above apply here also. G. Pressure regulator sticks, causing pilot flame to drop. H. Blocked exhaust, causing pilot to snuff out.	A through F in #5 above apply here also. G. Check regulator action with manometer. H. Inspect Lint trap and vent pipe.	A through F in #5 above apply here also. G. Tap regulator. If condition persists, replace regulator. H. Clean lint trap, and vent pipe.
8.	- - -	Running	Not Glowing	Yes	Yes, valve is buzzing	A. Low line voltage. B. Poor electrical connection. C. Dirt on valve plunger, or in plunger tube.	A. Check with volt meter. B. Check electrical continuity thru all connections, particularly to gas valve. C. Remove valve head and inspect.	A. Report to utility. B. Repair poor connections. C. Carefully clean plunger, tube, and valve seat.
9.					Yes, valve does not close when power is disconnected	A. Dirt on valve seat.	A. Remove valve head and inspect.	A. Clean valve seat carefully.

- - - Indicates not important in observing this step.

must go back again to that instant when the timer was first set. At this point, the electrical heater, operating the warp switch, is energized. This switch is set to operate in approximately four minutes, if the pilot is not lighted by that time, or if the pilot switch has not closed the contacts to the main burner solenoid. Therefore, if the pilot has not heated the thermal element during this four-minute period to a temperature where the pilot switch operates, the warp switch will open its contacts and cut off gas to the pilot, as well as de-energize the ignitor coil. The dryer will remain in this status until the timer runs its complete course. Additional attempts can be made to relight, but if the same condition exists, the dryer will lockout each time. A service call is then in order to determine the reason for the failure to light.



Dual solenoid gas valve shown without cover and with automatic plug-in pilot.

• Service hints

As in the case of any other appliance, trouble-shooting cannot be comprehensively outlined in a text. Because of the infinite number of possibilities, the dryer serviceman must have a basic knowledge of the system, so that he can follow a logical sequence in finding the source of trouble. It is possible, however, to outline in its broadest form a suggested servicing approach, based upon a given set of symptoms. We are including here such an approach, in the form of a chart, for electric ignition systems.

Of course, a chart cannot begin to completely cover every type of system in the field today. However, based upon the conventional electric ignition system used by most dryer manufacturers, as well as the most common standing pilot systems, the four-column chart is offered. Column 1, under the heading "Observation," is the original report of trouble, or that which is observed by the serviceman. Column 2 lists a number of likely causes which might cause or contribute to the observed problem, as given in Column 1. Column 3 suggests a means of confirming the cause, or further diagnosing the problem. Obviously, there are many excellent means for confirming the cause of the trouble, but the ones listed in this chart are the most likely to be used by a serviceman with a minimum of equipment. Column 4 suggests a remedy, which in some cases is only to replace a particular component. Where this latter suggestion is made, it is usually based upon the fact that that particular component cannot be repaired in the field. ■

Next month Mr. Wechsler will discuss standing pilot systems for gas clothes dryers.

PART TWO OF A TWO-PART SERIES

CUSTOMER SERVICE

One-stop service is Minneapolis Gas Co.'s customer service goal. This article, the second in a series, explains how the company goes about attaining this goal through training and service analysis.

By PAUL W. KRAEMER, Manager of Utilization
Minneapolis (Minn.) Gas Co.

Minneapolis' utilization engineering laboratory runs a series of tests on a space heating appliance. All models of heating appliances must be submitted to the laboratory for approval before they can be sold in the gas company's service area.

GAS exclusive

THE area we serve is divided into seven service districts. Each district produces a nearly equal number of service calls. Each service district has approximately 25 servicemen. At the head of each district is a service supervisor who has for his clerical assistance a district clerk. The district supervisors report to the superintendent of service.

Service district boundaries are only imaginary geographic limits, and servicemen are dispatched to any geographic location as required. The work load is quite well balanced, however, and servicemen usually work within a small area in their district.

The district supervisor is responsible for his men's work quality and quantity, discipline, and field training. In addition he devotes his time as required for customer contacts on unusual service problems.

Each week there is a meeting of all utilization supervisors. The meeting is the sounding board for all new ideas, explanation of new procedures, discussion of individual problems, and any other business any supervisor may want to bring up. The meeting allows each customer service department to hear what other departments are doing and why. It is also the principal source of information for supervisors in the instruction of their men. Department heads of service, appliance installation, and customer order departments construct minutes to their men from this meeting. The minutes are printed bi-weekly.

Each supervisor holds a weekly meeting with half of his men. Purpose of the meeting is to keep men current with any new methods, changes, or appliances. The supervisor hands out and explains the department minutes and discusses safety and customer relations. We feel that safety and customer relations are such an integral and important part of customer service operations that we should take every opportunity to promote them.

Supervisors are selected from customer service employees through ratings by utilization supervisors. The raters score the applicants on each of several necessary attributes for a good supervisor and the man with the best all around rating is selected. After selection, the supervisor works in the training department until another opening occurs. During the period in the training department the new supervisor has time to become fully oriented to his new job while not under pressure from the experience of being responsible for a group of men.

• Literature and tools

One-stop service on all adjustment service is our goal. Naturally, one-stop service on all parts replacements would require each serviceman to have a storeroom caravan following him. In accomplishing one-stop service, each man needs a set of reference literature plus his assortment of mechanical tools. With the thousands of makes and models of appliances and controls there is certain to be peculiarities to some appliances that servicemen must refer to in a normal day's work.

Our serviceman's handbook is prepared and kept up to date by the training department. The handbook includes prices of various replacement parts; wiring diagrams of several automatic appliances; orifice, piping and meter flow charts; conversion factors; pictures and instructions of various pilot and control replacements; and useful general company and service information not found in other available literature.

Current information on differences of new model appliances, company, manufacturer, or distributor policy changes, field observation findings, and public relations and safety messages are printed in the service department minutes. These are discussed and distributed in bi-weekly serviceman meetings conducted by district service supervisors. Each serviceman carries a loose leaf notebook to file the service minutes. At the end of each year the minutes are condensed and indexed to simplify and to replace the many pages collected over the months.

Additional reference literature for the serviceman is the AGA Dryer, Range and Water Heater Service Manual, and any manufacturer's literature which the training department acquires and decides each serviceman should have.

The complement of handtools includes a typical array of wrenches, screw drivers, power and hand drills with drill indexes, hand vise and taps together with an assortment of orifices, screws and bolts. In addition servicemen carry a combustible-gas meter, millivoltmeter, volt-ammeter, vacuum cleaner, manometer, thermometers, etc.

Available at the service buildings are CO meters, orsat flue-gas analyzers and continuous-reading CO_2 meters, velometers and draft gauges, vacuum pumps, acidizing pumps, microammeters and wattmeters, plus other useful test instruments.

• Storeroom supplies, parts replacement and repairs

We attempt to keep in supply replacement parts for all appliances likely to affect appliance operation. Such parts as main burners, which fail only in extremely rare instances, would not be stocked. This does not mean we keep a like for like replacement stock. Instead, our replacement stock of controls and pilots are those models which our service analysis shows to be the most trouble free. Also, controls which have become obsolete in manufacture are eliminated as soon as possible.

Thus, because of the superiority of non-linting pilots, other types of pilots that became defective are replaced by them. Similarly, original thermostats, valves, limits, etc., are replaced by those not as susceptible to failure.

The servicemen's guide in the replacement program is his handbook. The handbook contains a comprehensive list of controls and devices together with its storeroom status. It tells what the replacement control or device should be and whether a factory exchange replacement may be made and the price.

Replacement stock is under constant review and undergoes change whenever that change will help reduce future service calls. We don't want to perpetuate known causes of trouble.

An example of our pilot replacement methods as a part of our program to reduce known causes of service is available as AGA publication DMC-57-13, entitled "The Application of Non-Linting Pilots."

When a serviceman in the execution of a service call discovers a required repair such as a part in need of replacement or a deteriorated vent he first determines the customer's appliance warranty. If the appliance is new and in warranty the serviceman calls the dealer and gives him the part requirement information. When that part is delivered by the dealer a serviceman returns to install it.

If the appliance is out of warranty the serviceman informs the customer of the defect and suggests that he contact a repair company, or that he may have the gas company make the part replacements. If the customer wants us to make the repair, the serviceman has the customer sign a repair charge authorization form on which the serviceman has written the nature of the defect. When the repair has been made the customer is billed with his gas billing.

When a serviceman finds a defect that affects the safety of the appliance or its use of gas and the customer does not care to make the required repair, the serviceman either shuts off the appliance and hangs a red tag on the shut off or hangs a yellow tag describing the defect in a conspicuous place on the appliance. Both red and yellow tags are forms semipermanent in nature carrying an appropriate message with a space for the serviceman to write in a descriptive message.

Before the serviceman hangs a tag he has the customer sign it. A detachable carbon copy of the tag goes to the serviceman's supervisor for his information and action as necessary.

Any appliance covered by AGA appliance approval requirements but not carrying the AGA approval seal is red tagged and shut off.

• Space heating inspections

Our overall service program includes the inspection within a year of all new space heating installations

and then subsequent triennial to quadrennial inspections of all space heating installations.

Manpower and tool requirements make it logical to have the appliance installation department inspect all boiler installations and the service department inspect all warm air installations.

This inspection not only serves a useful safety and customer relations purpose, but from service analysis it proves to be an economic gain. The three- to four-year inspection easily pays for itself in decreasing service calls. It is especially helpful in ironing out the severe winter service peaks.

The inspection includes cleaning the pilot and main burner, timing the pilot safety, checking for automatic operation of all controls, an inspection of the vent, combustion changer, filters, vacuuming the combustion chamber if required, checking input, combustion and ignition and the taking of an order for the immediate replacement of any defective part.

Inspections are dispatched throughout the year at times when service and appliance installation orders do not constitute a full work load.

- **Engineering control of service methods and appliances**

The time worn adage, "there are many ways to skin a cat," also implies to service methods. Usually though, there is a best way or just a couple good ways of doing the job. If every serviceman had to decide for himself the way each repair or part replacement should be made it is probable there would be wasted time and many repairs would be less than ultimate. First, when parts are replaced, they should be replaced with the most trouble-free type. Standard checks should be made after completing repairs to insure good operation.

As repair and service problems of any kind occur the utilization supervisors discuss them at the weekly supervisors' meeting. If a method of repair or handling of the problem is agreed upon, all supervisors instruct their men accordingly. Those problems that require study for solution become the responsibility of utilization engineering. After proper study the recommended solution is discussed at a subsequent utilization supervisors meeting.

The use of photographs as a service method control has become invaluable to us. Each service district, the appliance installation department, and the training department have repair-methods books which consist of before and after photographs with an accompanying description. Utilization engineering is responsible for the information and its distribution. The photograph source is a Polaroid camera with close-up and flash attachments. The photographs are worth more than a thousand words to the supervisors in the instruction of men and in the availability of a simple reference.

Modernization of obsolete appliance control systems and the application of non-linting pilots are being simplified and more readily standardized with the photographs.

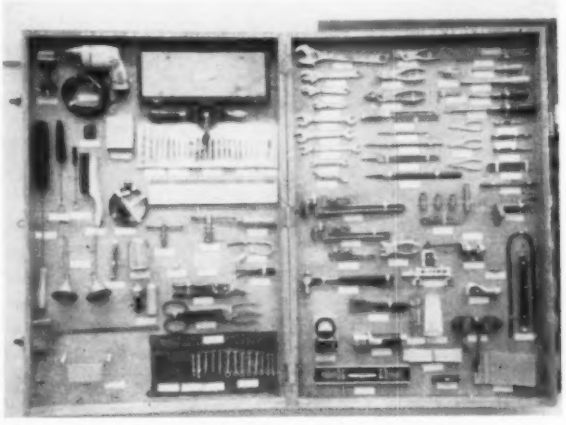
Another repair control is accomplished through the supervision of the utilization repair shop by a utilization engineer. The type of repairs made in the shop and the brackets or replacements made coincide with the approved service methods.

Only AGA approved appliances are approved for installation. In addition, before any appliance is merchandised by our company it is tested for performance, serviceability and safety. Each model of any heating appliance also must be approved for those features before it can be offered for sale in our area.

- **Service analysis**

Even though the actual repair or adjustment of malfunctioning appliances consumes the great majority of service manpower and money it is not more important, if as important, than the study of how to prevent the identical malfunction on new appliances being installed. It was for that reason we began the use of IBM mark sense cards as our original service order record and set up a systematic analysis of causes of service calls.

The result of our continuing service analysis is essential to us in every phase of our service operations. We attempt to give the analysis maximum effect by mailing copies of reports to the manufacturers whose products are involved.



This is the typical assortment of hand tools each serviceman carries.

A description of our analysis methods is available through AGA as publication DMC 55-9 entitled "A Modern Method of Service Analysis."

A second but not secondary method of keeping abreast of field problems is by means of field observation reports. Field observation reports give us information about any specific appliance or device that has questionable design or operational features.

When a serviceman observes any appliance or device that he feels should be investigated for any reason he notes this on a field observation report. The report is turned in together with daily service orders and routed to the training department. The training department acknowledges each report together with the disposition. That is, the serviceman is told in reply whether a letter is being written to the manufacturer, the solution to the problem that the service-

man was not aware of, that the report will be investigated or of any other appropriate handling. When the answer to any report is such that it is of interest or importance to other servicemen or mechanics it appears in the bi-weekly department minutes distributed to all men.

Besides serving its primary purpose of discovering and eliminating specific field problems, the program keeps the training department informed of current problems. Like the general service analysis, it is effective in devoting training activities to those subjects or phases that do the most good.

At the present time the AGA customer service committee is developing and sponsoring a "National Field Observation Program for Customer Service." This national program will operate similarly to our company program with the AGA Laboratories as the administering group. Such a program, with the cooperation of all companies, can be a tremendous tool in improving appliances and reducing service costs.

It will be to every company's advantage to join the AGA field observation program. The AGA publication, "The National Field Observation Program," will explain the details of the program and how anyone can be a part of it immediately.

• Service call-backs

Analysis of service call-backs is an effective means to evaluate service policy pertaining to mechanical procedures and of individual service.

For practical usefulness of a service call-back analysis, we have decided that service calls within 30 days on the same appliance tell an adequate story.

Telephone service orders are recorded by date and appliance in quick reference files in address order. Because of the wide range of frequency of the receipt of telephone orders the economics of always recording on receipt is poor. Instead, we often do not make the record until the order is completed. Clerical availability dictates the recording periods.

At the time the entry is made under the address the clerk observes whether an entry had been made on the same appliance within 30 days. If one has been made, he makes a record of the address.

At regular intervals call-back orders with the previous call or calls are taken from the customer service history file for each call-back address. The training department reviews and summarizes the orders and routes each call-back to the supervisor of the service district involved.

The service supervisor reviews the order and discusses it with the serviceman whose call resulted in the call-back.

We feel this system accomplishes two important things: It allows each serviceman to review his errors. It points out to the training department and each supervisor where the greatest need for instruction lies.

• Dealer cooperation program

The overall dealer relationship is handled by our sales department. However, the operation of much of it is up to the customer service departments. The program is geared to make the appliance dealers want to sell gas appliances by removing their installation and service burden. It also assures well adjusted and repaired appliances for customer satisfaction.

The program includes the replacement of defective parts of appliances in warranty if the dealer delivers the part to the customer's home or to a company service building and makes no charge to the customer for the part. In order to maintain a reasonable control, dealers register their warranted appliance sales by a form postcard mailing to the service department. The form includes make and model of the appliance and date and address of installation.

The appliance installation department installs and adjusts all new range sales and all refrigerator sales for dealers at a nominal charge. The installation program has much additional value in providing a good operating and adjusted appliance from the moment it is installed.

In addition to the new appliance services, repairs to other appliances are made on a cost basis. As far as the service department is concerned as long as the appliance burns gas we service it. No difference is made for our company sales.

• Inter-department controls

Without a constant supply of conditioned and odorized gas and without the gas distributed between narrow pressure limits to the customer, any service department is fighting a losing battle. Service department problems must play a part in distribution and production department planning and operation for ultimate results.

All of our gas is odorized. In some parts of the system oil is fogged into the gas main. The primary control of odorization is through daily service department reports to the production department on leak calls and regular reports on odor level as measured by portable odor-meter devices at various parts of the distribution system. The primary control on oil fog rates is through a continuing plot of service calls related to oil or dust kept by each service district and reported as necessary to the distribution department.

Pressure fluctuations, especially in low pressure systems, is a severe aggravator of service. The less noticeable and often not noticed pressure differences are almost as costly as large pressure differences. Assume for example, a system is designed to operate at 7-in. wc but during load peaks operates at 4 in. At 4 in., automatic safety device service will be much greater than normal because of the reduced heat on the safety element. A plot of service calls and system pressures on a map for peak sendout and service periods is convincing.

Thus, as a mutual benefit to both service needs and for distribution planning, servicemen record static and working pressures in homes on service calls during certain peak load periods as directed. These pressure readings supplement the pressure recording locations in the system and quickly locate any pressure problems peculiar to small areas.

Any success in satisfying customers that our operation may have is due largely to the fine cooperation of men, supervisors, and management. The general atmosphere of mutual interest and progressive attitude is the essence of accomplishment. ■

GAS · Pipeline News

Gas lights are burning from one end of the country to the other. Above, Leo H. East, executive vice president of Rochester (N. Y.) Gas & Electric Corp., lights the 19th century gas street lamp installed in front of the company's employee center. This ceremony marks the passing of 110 years since the organization of Rochester Gas Light Co. in 1848. Shown with Mr. East are (from left) F. J. Pfluke, general superintendent of the gas division; Linn B. Bowman, vice president of gas and transportation; and Ernest J. Howe, president. Mrs. Maria Theresa Urrea Sullivan (below), descendant of one of the first families to settle in Albuquerque, N. M. in 1706, lights the first of 64 new gas lights which illuminate historic Old Town Plaza. Standing beside Mrs. Sullivan is Mayor Maurice Sanchez. Southern Union Gas Co. installed the gas lights on standards erected several years ago as memorials to pioneer families of Albuquerque.

Portland Gas & Coke chooses new name

Northwest Natural Gas Co. is the new name of Portland (Ore.) Gas & Coke Co. The new name is more descriptive of the company's operation.

The Portland-based company is extending its regional status by acquiring LPG operations at Eugene, Springfield, and The Dalles, all in Oregon. Subject to approval of the Oregon Public Utility Commission, the first purchase will extend the company's Willamette valley system to communities 120 miles south of Portland. The second takes in an important mid-Columbia river port, 85 miles east of Portland.

President Charles H. Gueffroy said natural gas is the goal for the new territories. El Paso (Texas) Natural Gas Co. has agreed to build a 125-mile line reaching the Eugene area from a point along the Pacific Northwest Pipeline Corp.'s line across the Columbia river from Portland. El Paso also plans to build a shorter lateral to serve The Dalles from the same PNW line north of the Columbia. The plan to build the two laterals, however, is conditioned on federal approval of the proposed merger of PNW and El Paso.

Revised free extension rules proposed

Changes in rules governing free extension of gas piping to new homes were proposed to the California Public Utilities Commission by representatives of Southern California and Southern Counties Gas companies.

Under the new rules, the Los Angeles-based companies propose to make free allowance of piping as based on the number of gas appliances in a particular home. The more gas appliances are used, the more liberal the allowance the gas companies will make.

Here is how it works: A three-use customer—cooking, water heating, and househeating—will be extended a free allowance of 200 ft of main and 95 ft of service piping. (More than 90 per cent of homes served by SoCal and SoCounties are three-use customers.)

A two-use customer (water heating and househeating) will have a free allowance of 130 ft of main and 30 ft of service piping.

The proposed allowances cover homes on the fringes of the companies' systems as well as those at the relative center. In addition, there will be no differentiation made between extension of piping to an individual home and a tract.

In general, the proposed rules conform closely to principles established by the PUC staff as part of the commission's current investigation to guide design of service extension rules of all utilities under its jurisdiction, gas as well as electric.

Appalachian measurement school set for August

Initial plans are completed for the 18th annual Appalachian Gas Measurement Short Course to be held Aug. 25-27 at West Virginia University, Morgantown.

Subjects to be covered in the intensive three-day course include the fundamentals of gas measurement and special sessions on domestic meters, orifice meters, large capacity meters, automatic control instruments, pressure regulators and other related equipment. Basic courses will be offered for those new in the industry. Monitored open forum discussions and actual demonstration classes in the application and servicing of gas equipment will be offered daily.

James W. Chrisman, East Ohio Gas, is general chairman, and Carl D. Rader of Tennessee Gas Co., is program chairman. R. E. Hanna and R. W. Laird of the university faculty are in charge of publications registration, exhibits and housing.

Construction under way on Ontario city gas systems

The $15 million construction program that will bring natural gas to communities through northern and central Ontario was launched recently in Orillia and Huntsville.

Distribution systems will be built in 33 communities this summer by Northern Gas Co. Ltd. and Twin City Gas Co. Ltd. These affiliated companies hold franchises for the distribution of Alberta gas to communities located along the route of the Trans-Canada Pipeline (slated for completion Nov. 1). The 1100-mile-long franchised area extends

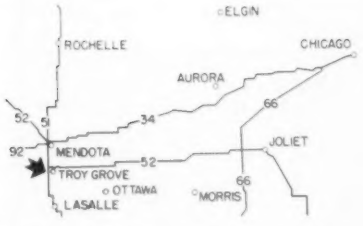
from the Manitoba border to Orillia. Northern Ontario and Twin City plan to have all their distribution systems ready to receive gas well in advance of the Nov. 1 arrival date.

Independent service program established

Improving repair service for home appliances is the aim of Robertshaw-Fulton Controls Co.'s newly established network of franchised repair and replacement depots.

The independent reconditioning companies, set up through the company's national service division, are franchised by Robertshaw-Fulton. They are equipped to repair or exchange any Robertshaw controls in ranges, water heaters, space heaters, air conditioners, central heating equipment, and other basic home appliances.

Nine centers are currently in operation. They are located in Minneapolis, Detroit, Milwaukee, Denver, Valley Stream (N. Y.), New Orleans, Orlando (Fla.), Omaha, and Cincinnati. At least 10 more franchised depots will be established.



Location of Northern Illinois' proposed underground natural gas aquifer storage reservoir about 5 miles south of Mendota.

Northern Illinois seeks underground storage okay

Northern Illinois Gas Co., Bellwood, is seeking state approval of its plan to develop an underground gas storage field on a pilot basis at Troy Grove near La Salle, Ill.

E. D. Sheehan, vice president in charge of operations, reports that preliminary geological studies and numerous test drillings indicate there are porous and permeable sandstone formations about 1400 ft below the surface. These may prove suitable when fully developed to store the gas.

Mr. Sheehan emphasized that it would be at least a year before Northern Illinois would be assured that the Troy Grove structure might serve as a storage reservoir. The company is studying the possibilities of other similar sandstone strata in the same general area.

If tests prove out, the company could use the underground storage project during the 1960-61 winter.

To date, seven wells have been drilled at the 2000-acre site to depths ranging down to about 3500 ft. An eighth well is to be completed before the start of test injections of gas.

Test drilling operations continue 24 hours a day, seven days a week, at the proposed storage reservoir.

Gas refrigerator makes its second debut

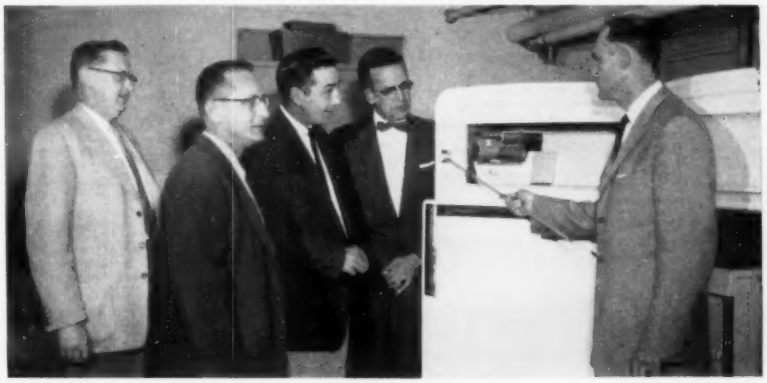
All-gas kitchens are once again a reality with the introduction of the RCA Whirlpool gas refrigerator.

First production model was the top-of-the-line Imperial, a two-door 11-cu ft model with an automatic ice maker, a separate 70-lb freezer, and automatic defrosting. Two single door models will be available this month. They will provide 10 cu ft of food storage capacity, including room for 49 lb of frozen food in a separate freezer. A 9-ft model also will be available this month.

Whirlpool Corp., St. Joseph, Mich., bought the gas refrigerator manufacturing facilities of Servel Inc. on January 3, 1958. In just over three months, on April 14, Whirlpool began its pilot run of the first RCA Whirlpool gas refrigerator. In that time, the company redesigned the predecessor refrigerator, trained a corps of welders and production people, set up a gas utility department in its utility division, and established initial sales, advertising, and promotion plans.

NICB chooses gasmen

Gardiner Symonds, president of Tennessee Gas Transmission Co., and Col. Willard F. Rockwell, chairman of the board of Rockwell Manufacturing Co., were elected to offices at the 42nd annual meeting



Whirlpool field representative George Anderson (right) conducts one of the 16 nationwide schools for distributor service personnel of the new RCA Whirlpool gas refrigerator.

of the National Industrial Conference Board.

Mr. Symonds is serving a one-year term as vice-chairman. Col. Rockwell will serve as a trustee until 1961.

U. S. Chamber honors ALG

Arkansas Louisiana Gas Co.'s program of contributing to economic understanding among its employees has been rewarded by the U. S. Chamber of Commerce.

"Most outstanding display" award went to this Pacific Coast Gas Association booth (co-sponsor: Washington Natural Gas Co.) at the recent Pacific Northwest Restaurant Convention and Exposition in Seattle. Equipment dealers reported outstanding sales success resulted from the display.

ALG's program includes weekly letters from President and Board Chairman W. R. Stephens, a monthly publication, letters to wives of employees telling them of their husbands' work and the company's aims. ALG also launched a series of meetings and training schools which enable employees to come in contact with management officials.

United exploring for gas

In its search for new gas supplies, United Fuel Gas Co. is spending some $7.6 million this year in West Virginia and Kentucky. The Charleston-based company will drill 110 production wells in West Virginia and five test wells in neighboring Kentucky.

President John W. Partridge said the 140 production wells will aid in replacing depleted wells which are being abandoned. The five Kentucky test wells will be drilled to explore deeper production zones in fields which have produced gas from shallow wells.

Code revisions proposed

Changes have been proposed in the American Standard covering "Installation of Gas Piping & Gas Appliances in Building." The code is being editorially revised for clarification where necessary and to bring the standard in line with recent installation experiences. Included are provisions for built-in

Continued on page 70

IT PAYS TO USE THE ROCHESTER MAGNETRON TANK GAUGE

The Rochester Magnetron Tank Gauge is designed specifically for LP-Gas and other petrochemical bulk storage tanks. Successful bulk plant operators throughout the nation have found it *pays* to use the gauge designed and built for the job. Here's why the Magnetron can do the job better than ordinary gauges:

1. 8" dial chamber for easy reading... hermetically sealed.
2. No tank pressure on dial... dial may be removed even with gas in tank.
3. Large stainless steel float.
4. Critical internal parts of stainless steel or brass.
5. Magnetic drive with large heavy-duty Alnico permanent magnets.
6. Only one tank opening is required.
7. Available for top or side mounting.

The Magnetron guarantees dependable accuracy, is easier to read, and will last longer with less maintenance.

Write for further descriptive material about the Rochester Magnetron... today.

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ANOTHER GREAT GAS RANGE FIRST FROM ROPER!

TOP-OF-RANGE ROTISSERIE, VERTICAL BROILER AND GRIDDLE

Revolutionary ROPER

Rotis-O-Grill

Pulls More Prospects — Makes More Sales

Here's 4-way cooking convenience never before offered! "Rotis-O-Grill" twin burners provide instant heat, penetrating radiant heat. Clean and spatter-free barbecuing, broiling or grilling. "Thermo-Spit" meat thermometer ends guesswork. "Rotis-O-Grill" adds welcome extra capacity to the cooking top, too . . . does more jobs at once. Make your selling easier, more profitable . . . sell "Rotis-O-Grill."

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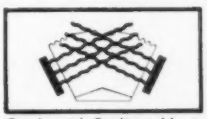
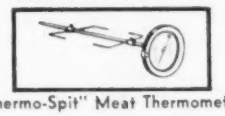


Cooks with Radiant Heat



"Thermo-Spit" Meat Thermometer

ROPER

"America's Finest GAS Range" . . . Now Finer than ever!

GEO. D. ROPER CORP., KANKAKEE, ILLINOIS

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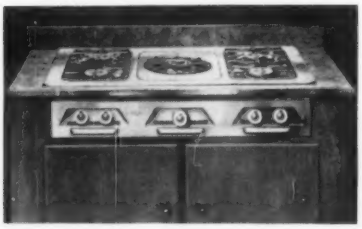
GAS DIGEST

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 67, 68

1. Refrigerators

First RCA-Whirlpool gas refrigerator in production is the top-of-the-line Imperial EGM-11T, a two-door, 11-cu ft model with an automatic ice maker, a separate 70-lb freezer, and automatic defrosting. Other features include two-glide-out aluminum shelves with safety stops, tilt-out compartments for butter and eggs, full-width door shelves, adjustable cold control, two porcelain enamel crisper drawers, and porcelain enamel interior.
Whirlpool Corp.



2. Built-in top burners

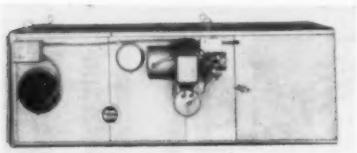
Flush-to-countertop installation is a major appeal of two of the eight completely new built-in gas top burner cooking units introduced by Roper. Largest of the new built-ins is a 38-in. five-burner model. The center burner is a thermostatically controlled Tem-Trol burner that converts to an automatic griddle. Covered, it provides extra work surface.
Geo. D. Roper Corp.

3. Furnace line

A metal used to protect jet engine components from high temperature damage is used in heat exchangers in Bryant's new gas-fired furnace line. TRI-alloy is a metal and ceramic combination which has been fused to steel. It protects from high heat and corrosive flue gases and condensation when the furnace is not in use. Upflow, counterflow, and horizontally mounted units are in the line.
Bryant Manufacturing Co.

4. Income-property furnace

A new forced air furnace for multiple unit dwelling application features an exceptionally low noise level blower and heat input, more closely tailored to requirements. Gaffers & Sattler's new unit is made in 14-in. wide casings to permit substitution of oversize blower and motor in event an apartment owner wishes to add summer air conditioning up to 2-ton capacity.
Gaffers & Sattler



5. Two-in-one furnaces

Suspended warm air furnaces with bonnet ratings of 84,000 and 112,000 Btu/hr have been added to the John Wood furnace line. Actually two-in-one units, the new furnaces are designed as suspended units or as high-boy units, depending on requirements. Conversion from a high-boy to a suspended unit or vice versa is simple.
John Wood Co.

6. Warning flag

"Saflag" is a new versatile type of barricade and truck warning flag that can be seen by night or day. The new flags, made of 100 per cent ingrain nylon material in neon red color, are both fluorescent and iridescent. The flags feature diagonal stays to hold them open.
Davis Emergency Equipment.

7. Trencher

The 1958 M-2 Ditch Witch features a new speed reduction unit with Select - O - Matic shift from digging speed to mobile speed, providing four speeds forward and reverse. New optional feature is a sod - cutting attachment which when mounted on the trencher cuts an 8-in. sod strip at speeds up to 40 ft/minute.
Charles Machine Works

8. Power control unit

Being field-tested by General Electric is a power control unit for two-way radio systems which even-

tually may help reduce some of the communication industry's interference problems. The device automatically adjusts signal output of a base station transmitter so the signal transmitted is no more than needed to reach a specific mobile receiver.
General Electric

9. Terminal fitting

Tapecoat Co. is producing a new type of terminal fitting for use in extending gas distribution systems. Known as TC terminal fitting, the new product features a fusible sealing disc which assures positive flow when melted. The fitting provides a simple method of purging air from new lines, facilitates equalization of pressure before line is put in service, and assures positive flow after fusible sealing disc is disintegrated.
Tapecoat Co.

10. UPVC fittings and pipe

Tube Turn Plastics and Swepco Tube Corp. have joined to produce unplasticized polyvinyl chloride lined fittings and pipe. The Swepcore UPVC lined pipe, which will normally be furnished with a steel shield, and Tube Turns TTP UPVC lined cast iron fittings will be available immediately.
Tube Turns Plastics

11. Gate valves

The cylindrical body featured in a newly designed line of 200-lb bronze gate valves from Crane provides great resistance to line distortion and internal pressure. New, expanded-type chromium steel alloy body seat rings can't loosen in service.
Crane Co.

12. Helium separation

A diffusion technique which is said to ease the large-scale separation of helium from gaseous mixtures such as natural gas has been developed by Bell Telephone Laboratories. In the newly developed process, helium is separated from a gaseous mixture by passing the mixture over the surface of glass which has a high permeability to helium and low permeability to other gases.
Bell Telephone Labs

13. Split-channel conversion

Simple, low-cost conversion kits will adapt any Motorola mobile two-way radiophone sold since 1949 to full split channel operation. Since 1949 Motorola has anticipated eventual split channel requirements and has designed its equipment accordingly. Its equipment includes such refinements as the patented adjustable "Instantaneous Deviation Control" circuit, use of oven-type crystals, and the interchangeable "Permakay" filters in its mobile and base station units.
Motorola Inc.

14. High-pressure pipe cutter

Mueller is producing an automatic, high-pressure drilling machine for making cuts from 2 in. through 6 in. in any type of pipe. Called the CH-6 machine, it is intended for use on distribution systems and transmission lines where connections are required under pressure. It features a full-time direct-reading tool position and feed indicators. Also featured is automatic disengagement of the tool feed.
Mueller Co.

15. Fiberglass tubing

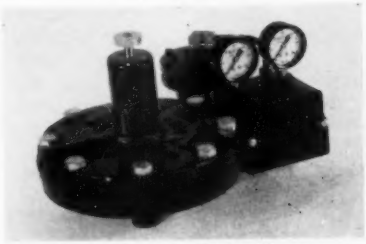
A new structural fiberglass tubing has been developed by Gar Wood's fiberglass division. The tubing is produced in a variety of types, diameters, and lengths. It is reportedly impervious to soil chemicals, weathering, and extremes of temperature and light. Couplings and fittings, made of pressure-laminated fiberglass, also have been developed for use with the structural tubing.
Gar Wood Industries Inc.

16. Diaphragm feeder

A compact, redesigned version of the wall-mounted Proportioneer diaphragm feeder has been produced. Model 19130, designed to handle concentrated chemicals safely, takes up less than half the space of the former model. The feeder pumps directly from carboys, drums, and other shipping containers without dangerous transfer to storage units.
Proportioneers Inc.

17. Pipeline sphere

The Maloney pipeline sphere is a liquid-filled rubber sphere designed to operate in product lines where an intermediate seal to transmit pressure is desired. Especially designed for product separation and calibration of meter loops, the sphere also has been found suitable in other applications.
F. H. Maloney Co.



18. Liquid level controllers

Although designed specifically for inlet gas scrubbers on compressors, Kimray's PLC series floatless controller may be applied to any liquid level control job in conjunction with a diaphragm type motor valve. Pilots have built-in mercury-filled snubber which dampens or reduces effects of pressure pulsation.
Kimray Inc.

19. Engine valves

New valves for natural gas and diesel engines with heads greater than 2½ in. in diameter are now being manufactured for the replacement trade. Valves for engines such as Clark, Fairbanks Morse, Nordberg, Worthington and other large size valves are available.
N.A.D. Co.

20. Four-frequency unit

Busy signals are held to a minimum with a new four-frequency mobile radiotelephone unit from RCA. The CWR-U1V-A unit was designed primarily to permit the handling of a greater volume of on-the-road calls by mobile telephone service users, in direct vehicle dispatch systems, and in connection with telephone company construction and maintenance.
Radio Corp. of America.

GAS DIGEST

21. Tank gauge

Designed for use with LPG and other petrochemical bulk storage tanks is Rochester's Magnetron heavy-duty tank gauge. It has an 8-in. dial chamber, hermetically sealed, that allows the operator to keep an accurate running check on his product even though he is some distance away. The dial is removable, even when the tank has gas, because there is no tank pressure on the dial.
Rochester Gauges Inc. of Texas

22. Conversion burner

The Adams HS tubeless cast iron inshot gas conversion burner comes completely assembled, all ready for speedy, one-man installation. It converts oil-fired furnaces and boilers to automatic gas heat, including most revertible flue furnaces. The burner is fully equipped with a choice of self-generating or 24-v controls—manifold sizes ½ and ¾ in.
Adams Manufacturing Co.

TRADE LITERATURE

23. Cathodic protection

Hot-spot cathodic protection for bare or poorly coated pipelines is discussed in a report from Corrosion Services Inc. Presented is an economic comparison between the use of two kinds of magnesium anodes.
Corrosion Services Inc.

24. Pipe locator

A new transistor pipe locator and metal detector is described by Gardiner Electronics. The detector has a maximum range of 21 ft.
Gardiner Electronics

25. Plastic ball valves

Chemtrol's new line of corrosion resistant plastic ball valves are the subject of a new catalog sheet.
Chemtrol

26. Cathodic protection

Lester cathodic protection rectifiers—selenium or silicon—are the subject of a six-page bulletin from the company.
Lester Equipment Manufacturing

27. Industrial gas equipment

The Buzzer line of industrial gas furnaces and burners is the subject of a new bulletin from Charles A. Hones. Fundamental descriptive matter, tables and Btu ratings are presented.
Charles A. Hones Inc.

28. Compressors and turbines

Clark's new composite catalog features the company's full line of compressors and gas turbines. The 40-page, illustrated catalog follows the principle that no two plant operations are exactly alike and that selection of proper compressors and gas turbines is determined by application requirements and careful unit engineering.
Clark Bros. Co.

29. Compact trencher

Big trenching machine features, incorporated in a compact unit, are the subject of a 4-page bulletin on the new Parsons 77 Trench-liner. Photos show how the 3-ft 10-in. wide and 5-ft 8-in. high unit operates in close quarters.
Parsons Co.

30. Test instruments

Bristol's indicating, recording, programming and controlling instruments for environmental test equipment are the subject of a new bulletin.
Bristol Co.

31. Plastic-coated pipe

Recent improvements in Republic's X-Tru-Coat plastic-coated steel pipe and tubing are covered in a new four-page folder. Problems of pipeline corrosion are described in the folder which also shows how the strength of steel and the protection of plastic are combined to meet needs of the most severe corrosion applications.
Republic Steel Corp.

32. Fittings and flanges

Babcock & Wilcox has published a catalog on its seamless welding fittings and forged steel flanges, which are produced to close dimensional tolerances.
Babcock & Wilcox.

33. Safety relief valves

Detailed information for selection and sizing of all Farris nozzle safety relief valves is included in a new specification catalog. The 44-page catalog has sizing factors and formulae; nozzle capacity charts for air, water, gas and steam; and dimension and weight tables.
Farris Engineering Corp.

34. Degree-day counter

A folder and specification sheet from the Hidy-Brown Recorder Co. gives detailed information on the company's continuous degree-day recorder, which reportedly saves up to 30 per cent on record and bookkeeping costs.
Hidy-Brown Recorder Co.

35. Valve position transmitter

A pneumatic valve positioner transmitter for converting mechanical variables into a proportional pneumatic output pressure is discussed in a new bulletin. Operation and advantages of Model AVPT are presented, together with photographs and line drawings.
B-I-F Industries Inc.

36. Heat exchanger

Described and illustrated in a new 12-page catalog is the Fin-Pak, a new heat exchanger that can operate with low-pressure drops under high pressure differentials for gas to gas, gas to air, or gas or air to liquids.
Air Preheater Corp.

37. Dew points

A new instrument for measuring dew points, the Alnor Dewpointer, is the subject of an 8-page bulletin. The principle of varying pressure determines dew points of any gas sample.
Illinois Testing Laboratories

38. Steel valve

Kerotest has published a full-color, 4-page brochure explaining the operating principles of its latest steel valve, the Keroseal. It is a full-opening, double block and bleed, non-lubricated, optional flow valve which offers a vapor-tight seal.
Kerotest Manufacturing Co.

39. Swimming pool heater

Malsbary's indirect system for heating swimming pools is discussed in a new piece of literature. The heating system is said to end scaling and condensation.
Malsbary Manufacturing Co.

40. Room heaters

A four-color, six-page catalog describes Stiglitz Corp.'s new Decorator model room heaters. Featured in the catalog is a heat planning guide, which takes guesswork out of homeheating planning.
Stiglitz Corp.

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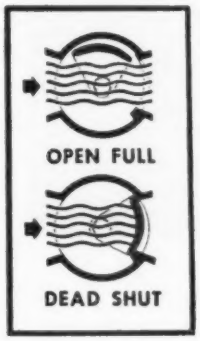
refinery piping requires THE BEST in valves... that's DeZurik!

NO OTHER VALVE can give you the advantages of DeZurik's EXCLUSIVE Eccentric Action in combination with resilient-faced plugs. NO OTHER VALVE can give you *tighter shut-off — easier operation — WITHOUT LUBRICATION!*

DeZurik's exclusive eccentric action pivots the plug eccentrically, matching an eccentrically-raised seat. The plug touches the body *only* when the valve is shut. In opening the valve, the plug backs away from the seat and swings aside in an easy quarter-turn . . . without friction, without binding, WITHOUT LUBRICATION!



DeZurik Valves are available in sizes ½" thru 20" in many metals and models with a full range of operators. See the DeZurik representative in your area, or write for details.

DeZURIK CORPORATION
SARTELL, MINNESOTA

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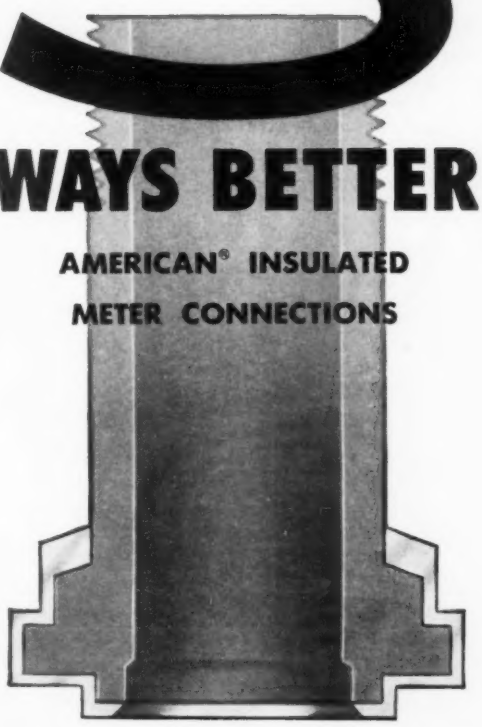
AMERICAN® INSULATED METER CONNECTIONS



1 **Permanent, molded-on design**—insulation covers pilot flange . . . extends up the body — no loose parts — simplifies assembly and minimizes possibility of short circuit due to moisture.

2 **Tough, Nylon insulation** — high mechanical strength prevents crushing — seals tight — high dielectric strength eliminates electrolysis.

3 **Interchangeability** — insulated meter connections are interchangeable with standard connections — will accept standard caps and washers reducing inventory problems.

Ask your nearest American representative for Bulletin 308 describing all insulated and standard meter connections.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. • Albany Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood. IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

from page 62

domestic cooking units, smokeless, odorless incinerators, domestic clothes dryers and unit heaters with reduced clearances to combustible construction.

Berkshire gas expanding

Berkshire Gas Co., Pittsfield, Mass., has bought Greenfield (Mass.) Gas Light Co. Greenfield was being reorganized, after having been declared insolvent by the U. S. District Court for the District of Massachusetts.

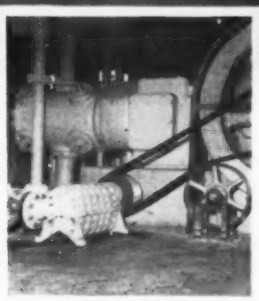
Greenfield had 3200 manufactured gas customers in Greenfield and Turner Falls. Berkshire, serving 11 communities in the western part of the state, has about 23,000 customers.

According to Berkshire Gas, the company is seeking a natural gas connection with Tennessee Gas Transmission Co.'s system.

American Recording Chart Co. has completed its new Los Angeles plant for the fabrication of Arcco recording charts as well as other products. The new building, more than double the size of the former plant, is completely air conditioned for both humidity and temperature. Storage for recording charts has been increased from 5 million to more than 25 million.

ALL-HYDRAULIC

GASOLINE PLANT



Power source for the system are two Berry Pumps driven by the main gas compressor engines. These pumps furnish oil to the hydraulic motors driving the cooling tower fan, raw water pump, treated water pump, boiler forced draft fan, and two ammonia refrigerant pumps.

CHILLGAS ENGINEERING Design Provides Substantial Economies for LLANO GRANDE Corporation

At the Llano Grande satellite gasoline plant all auxiliaries are driven by Berry Hydraulic Pump/Motor Transmissions. This non-hazardous, variable-speed hydraulic system is priced competitively with constant-speed drives—but less expensive to operate. A further advantage —the plant can be operated unattended, since all processes can be controlled automatically by using the infinitely variable speed range of Berry Pump/Motor units.

Write for Technical Bulletins.

BERRY HYDRAULICS

A DIVISION OF OLIVER TYRONE CORPORATION
GENERAL SALES OFFICE: OLIVER BUILDING
PITTSBURGH 22, PA.

Joint operation studied

Iowa-Illinois Gas & Electric Co., Davenport, and Iowa Power & Light Co., Des Moines, are studying the feasibility of combining to form a single company. Stone & Webster will conduct the study.

Preliminary plans call for retaining the operating headquarters of the present Iowa-Illinois organization in Davenport with important staff functions of the combined operation also centered in the Quad-Cities, and a general headquarters in Des Moines. The two companies serve a total of some 206,000 gas customers and 270,000 electric.

New standard proposed

AGA Laboratories have distributed proposed American Standard approval requirements for gas-fired air conditioners of the absorption type.

In its present form, the proposed standard applies to gas-fired absorption cooling air conditioners for indoor installations, which are designed to supply cooled air or chilled liquid to spaces remote from or adjacent to the appliance installation. Expansion for coverage of other types can be expected as new systems are developed and marketed. The standard is being kept broad in coverage so as not to hinder possible future developments.

PUAA honors utilities for advertising

Ninety-eight utilities in the U. S., Hawaii, and Canada were honored for their advertising achievements by the Public Utilities Advertising Association.

Leading the field was South Jersey Gas Co., Atlantic City, which took seven awards.

Among companies winning five awards each: Pacific Gas & Electric Co., San Francisco; Consumers Power Co., Jackson, Mich.; and the joint entry of Canadian Western Natural Gas Co. Ltd. and Northwestern Utilities Ltd., Calgary, Alberta.

Among four-award winners: Brooklyn (N. Y.) Union Gas Co. and East Ohio Gas Co., Cleveland.

Among three-award winners: British Columbia Electric Co. Ltd., Vancouver, B. C.; Ohio Fuel Gas Co., Columbus; Oklahoma Natural Gas Co., Tulsa; Philadelphia (Pa.) Electric Co., and Southern Union Gas Co., Dallas.

GAS • News Notes

"Modern Heating Demands Modern Venting" is the title of a new brochure from the gas vent and chimney division of GAMA. Covered in the booklet are functions of the Type B gas vent and the factory-built chimney. Copies are available from GAMA, 60 E. 42nd St., New York 17.

Pleasant Valley Gas & Oil Co. has abandoned further drilling of its well near Chehalis, Wash. after reaching the 8015-ft depth (March GAS, page 88).

High test line pipe will be produced at a new continuous butt-weld pipe mill planned by United States Steel Corp.'s National Tube division at Lorain, Ohio. Some 237,000 tons of 1¼- to 4-in. pipe will be produced annually. Completion is expected in the next two to three years.

Polyken Sales division of the Kendall Co., Chicago., named Patterson Supply Co., Denver, as a distributor to provide increased service to the Southwest and Rocky Mountain areas.

Utah Gas Service Co., now distributing gas in Grand, San Juan, and Uintah counties, has won PSC approval of its plan to extend its service to Daggett county.

The United Shareholders of America award for outstanding management-shareholder relationship was presented to L. T. Potter, Lone Star's chief executive, at Lone Star Gas Co.'s annual shareholder's

NEW low cost BASO® test kit No. 120-1

$27.50 each net

$25 each net for lots of 4 or more

Furnished without batteries

Multi-purpose, quality instrument checks...

- **DROP OUT** values of thermoelectric power units
- **MV OUTPUT** of thermocouples and pilot generators
- **PERFORMANCE** of pilots during main burner operation
- **CONTINUITY** of any electrical circuit

GAS UTILITY AND DEALER SERVICEMEN — Here's today's most *dependable, multi-purpose instrument* for on-the-job testing of gas burner controls. Functionally engineered for accuracy and long life, this new *low-cost* Baso test meter has three wide division scales for accurate reading of 0-30, 0-300, and 0-900 for both millivolts and milliamperes.

Instrument features an overlapping contact switch that prevents power unit drop out during switchover from MA to MV. Test Kit includes three leads with adapters for control testing and one Y-lead with alligator clips for continuity and general use.

Obtain your new Baso Test Kit today. Write or wire Baso Inc., or call your nearest Baso Replacement Depot.

BASO INC.

Dept. SC-4 • MILWAUKEE 1, WISCONSIN

(Formerly Milwaukee Gas Specialty Company)

meeting. This is the third consecutive year the award has been received by Lone Star.

Iroquois Gas Corp., Buffalo, has New York PSC permission to connect an additional 10,000 gas-fired space heating installations.

Air Preheater Corp.'s sales and service office in Dallas has moved to the new Mercantile Dallas Bldg. The Dallas office serves Texas, New Mexico, Arkansas, Oklahoma, western Louisiana, and Mexico.

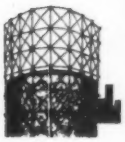
The Pelican Machinery Co., New Orleans, has been appointed by Koehring division, Milwaukee, and Parsons Co., Newton, Iowa, as their sales and service representative.

Arkansas Louisiana Chemical Corp., wholly owned subsidiary of Arkansas Louisiana Gas Co., has been chartered by the Arkansas Secretary of State to build and operate a $3 million chemical extraction plant near Magnolia, Ark. The new plant will produce an estimated 80,000 gal./day of ethane, plus 66,000 gal. of propane, and 27,000 gal. of butane.

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed



Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO... SPECIFY KRALOY PVC PLASTIC PIPE!

Representatives:
The Mack Company—Houston, Texas
H. J. Hodes—Kansas City, Mo.
The Crane Co.—Los Angeles & Denver
Southeastern Distributing Co.—Miami

Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*
4720 East Washington Boulevard, Los Angeles, California
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. Subsidiary

GAS CALENDAR

August

25-27. Appalachian Gas Measurement Short Course—University of West Virginia, Morgantown, W. Va.

September

3- 5. Pacific Coast Gas Association Annual Convention—Multnomah and Benson Hotels, Portland, Oregon.

5. New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

11. New England Gas Association Safety Conference — Sheraton Plaza, Boston.

12. New England Gas Association Commercial-Industrial Heating Division — Wachusett Country Club, West Boylston, Mass.

15-16. INGAA Annual Membership—The Roosevelt Hotel, New Orleans.

16-17. AGA 10th Annual Accident Prevention Conference — Sheraton-Seelbach Hotel, Louisville, Ky.

17-19. Southeastern Gas Association Annual Meeting—Sir Walter Hotel, Raleigh, N. C.

19. Oklahoma Utilities Association Gas Division Conference—Biltmore Hotel, Oklahoma City.

24-27. 7th International Gas Conference—Rome, Italy.

October

9-10. California Natural Gasoline Association 33rd Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena, Calif.

13-15. American Gas Association Annual Convention—Atlantic City, N. J.

15-17. Wisconsin Utilities Association Electric & Gas Sales Operating Convention — Hotel Schroeder, Milwaukee.

20-24. National Safety Council—Chicago.

30. New England Gas Association Operating Division — Sheraton-Kimball, Springfield, Mass.

31. New England Gas Association Accounting Division—Statler Hilton Hotel, Hartford, Conn.

November

19-21. Mid-West Gas Association Gas Meter & Service School and Conference — Iowa State College, Ames.

December

16. Rocky Mountain Gas Association Annual Meeting—Denver, Colo.

GAS ASSOCIATIONS

AGA committee chairmen honored during meeting

Eleven chairmen of AGA operating section committees have won service awards. They were presented at the AGA distribution, production and transmission conference held in New York recently.

Receiving awards were: Herbert S. Blanding, Consumers Power Co., customer service committee; A. L. Bristow, Northern Natural Gas, gas dispatching committee; William F. Burke, Lone Star Gas, underground storage committee; Hugh F. Stein, El Paso Natural, transmission committee; and Charles E. Terrell, Southern Natural, gas measurement committee.

Other recipients were: Edwin F. Trunk, Laclede Gas, distribution committee; Chester E. Upson, Texas Illinois Natural, communications committee; J. G. Voelker, Central Hudson Gas, manufactured gas production committee; O. W. Wade, Transcontinental Gas Pipe Line, corrosion committee; Donald L. White, Washington Gas Light, chemical and engineering committee; and D. K. Wilson, Niagara Mohawk Power, automotive and mobile equipment committee.

Carl Cloud heads SGA for coming year

Carl E. Cloud, president of Mid-South Gas Co., Little Rock, has succeeded Curtis M. Smith as president of the Southern Gas Association. Mr. Smith is vice president of Tennessee Gas Transmission Co., Houston.

Other new officers are: 1st vice president Oliver W. Clark, Southern Natural Gas, Birmingham; 2nd vice president, James A. Wilson, United Gas Corp., Houston; assistant secretary, Frank Barragan Jr., South Atlantic Gas Co., Savannah.

H. C. Webb, Oklahoma Natural Gas, was elected chairman of the advisory council, and E. Clyde McGraw, Transcontinental Gas Pipe Line, Houston, is vice-chairman.

New directors are: Joe C. Darrow, Lone Star Gas; Halcott P.

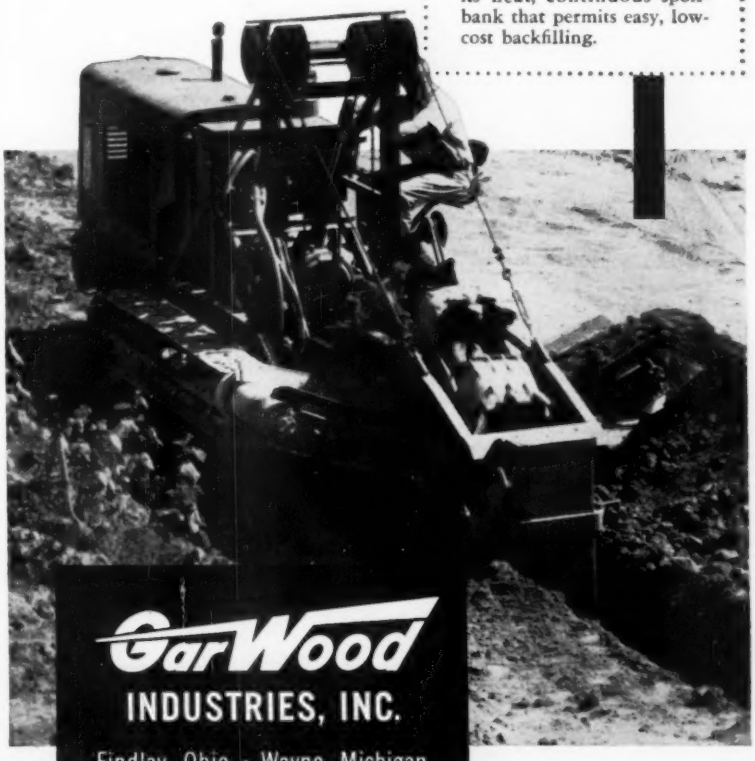
The Buckeye 307 digs CLEAN, LOW-COST DITCH

With the Gar Wood-Buckeye 307 ditcher, you'll do more than dig fast! Advanced "307" control system assures *cleaner* ditch that requires little or no hand-finishing. Here's why:

Grouped "307" controls simplify operation. For accuracy of depth and grade, hydraulic wheel hoist lets operator make on-the-go adjustments with one hand. "Live", independent control means greatest precision, fewer delays. And, hydraulic conveyor drive has 3 speeds in either direction. Offers instantaneous control to handle any volume of spoil—*independent* of digging wheel or travel speeds.

Learn all about the "307" and how it can dig lower cost ditch for *you!* Contact your Gar Wood-Buckeye dealer or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

This owner lays 400% more pipe per day since replacing a backhoe with the Buckeye 307. He praises the 307 for its neat, continuous spoil-bank that permits easy, low-cost backfilling.



Gar Wood
INDUSTRIES, INC.
Findlay, Ohio • Wayne, Michigan

Jones, Alabama Gas; H. A. Eddins, Oklahoma Natural; G. J. Tankersley, Western Kentucky Gas; Joe T. Innis, Northern Natural; Paul B. Payne, Dearborn Chemical. D. W. Weir was elected to fill the unexpired term of E. Clyde McGraw.

Association Notes

T. J. Hull is the new executive secretary of the National Association of Corrosion Engineers. He succeeds A. B. Campbell, who retired after serving as executive secretary since 1946. R. W. Huff Jr. has been named assistant executive secretary.

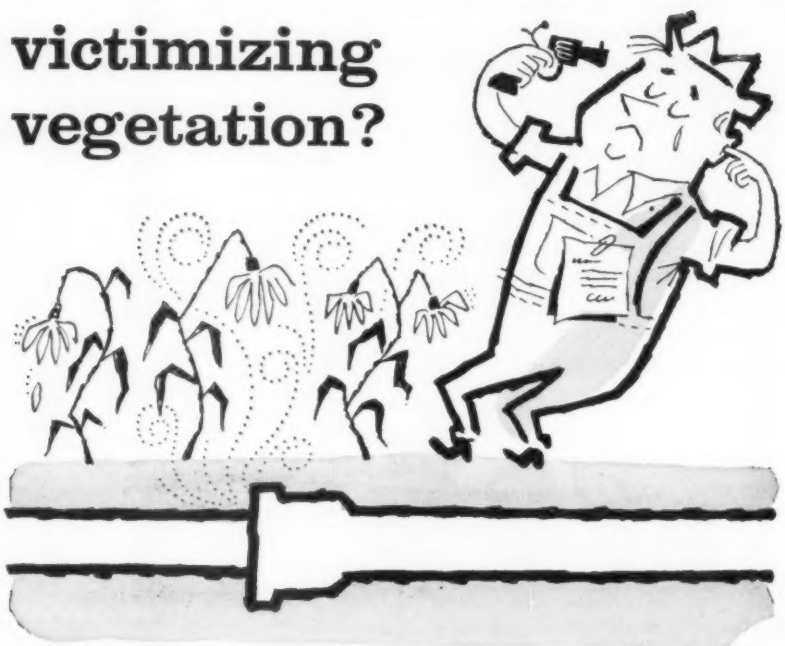
Newly elected officers and directors of Southern Gas Association are (seated, from left): James A. Wilson, 2nd vice president; O. W. Clark, 1st vice president; Carl E. Cloud, president; H. C. Webb, chairman, advisory council; and E. Clyde McGraw, vice chairman of advisory council. Standing (from left): Joe T. Innis, director; Willard G. Wiegel, treasurer; G. J. Tankersley, H. A. Eddins, Joe C. Darrow, Paul B. Payne, all directors; Frank Barragan Jr., assistant secretary; and R. L. Hinch, secretary.

R. Frank Nowlin, engineer of operations for the Houston division of United Gas Corp., has been elected general chairman of the 1959 Southwestern Measurement Short Course. The 1958 course, held recently at the University of Oklahoma, was attended by nearly 900 gas industry engineers and measurement experts from 37 states, Canada, and Mexico.

Texas Independent Producers & Royalty Owners Association elected Eugene M. Locke president for the company year. Mr. Locke is a partner in the law firm of Locke, Locke & Purnell and a director of Magna Oil and Dallas Tank Co. Raymond D. Reynolds, Houston geologist and independent oil producer, was elected secretary, and Vance Foster, vice president of the First National Bank in Dallas, was re-elected treasurer.

Don R. Weidenfeller, Baso Inc., Milwaukee, is the new president of the Gas Appliance Engineers Society. He succeeds S. C. Marshall, Minneapolis - Honeywell Regulator Co. Keith T. Davis of Carrier Corp. was named vice president and L. T. Tegler of A. O. Smith Corp. is serving as treasurer.

victimizing vegetation?



Leaking bell-and-spigot joints can ruin your public relations efforts. Vegetation damage means unhappy customers . . . unnecessary expenses. It puts pressure on your profit picture.

To solve the problem of dried out bell-and-spigot joints, gas utilities have turned to CARBOSEAL Brand Anti-Leak. By swelling the jute and hemp fibers as much as 44 per cent of their dry volume, CARBOSEAL Anti-Leak can eliminate leakage . . . with an estimated effective life of up to 25 years!

CARBOSEAL Anti-Leak is easy and inexpensive to use. Find out how other gas utilities have profited from this treatment. Write today for the booklet "Stop Gas-Main Leakage with CARBOSEAL Anti-Leak" and the 16 mm. color-sound motion picture "CARBOSEAL Anti-Leak Stops Gas-Main Leakage" . . . address Department B.

CARBOSEAL ANTI-LEAK

UNION CARBIDE CHEMICALS COMPANY

Division of UNION CARBIDE *Corporation*

30 East 42nd Street, New York 17, New York

In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal

The terms "Carboseal" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

GAS·PEOPLE

F. Tom Parks
Public Service

D. J. Miller
Public Service

F. TOM PARKS has retired as vice president and member of the board of Public Service Co. of Colorado after 42 years in the utility business. Under his direction, natural gas was introduced into Denver and other towns served by PSCo. of Colorado. He became a member of the board in 1939 and served in that capacity until 1943, when he was elected a vice president. Mr. Parks has just completed two terms as a director of the American Gas Association. Public Service Co. has also elected two new vice presidents. D. J. MILLER succeeds Mr. Parks as vice president, gas operations. O. P. REED is vice president, employee relations. Newly elected executive vice presidents are W. D. VIRTUE, M. M. KOCH, and R. T. PERSON.

STUART B. EYNON has been promoted to vice president in charge of operations by Heath Survey Consultants Inc., Wellesley, Mass. Mr. Eynon, with the company for 11 years, will be in charge of all Heath field survey operations for utilities and municipalities.

Two executive vice presidents, three vice presidents, and a comptroller have been named by Lone Star Gas Co., Dallas. LOUIS G. JAMES, vice president and comptroller, is now executive vice presi-

Stuart Eynon
Heath Survey

O. P. Reed
Public Service

Low, compact 155 digs 10 FEET DEEP

Small in size, big in capacity, Parsons 155 Trenchliner handles everything from mainline extensions to pipe reclamation and residential service connections. Developed especially for city work, this low, compact trencher cuts 16 to 26 inches wide — *at depths to 10 feet* — digs from 5.8 inches to 25 lineal feet per minute.

Operates in congested areas

The 155 works under low-hanging branches, in narrow alleys, between houses, and in other crowded areas, normally inaccessible to trenchers of comparable capacity. Height is only 7 feet-4 inches — width 5 feet-4 inches. It undercuts walks, curbs, cross-pipes — saves hand clean-up — also makes vertical set-ins, flush with foundations. Hinged crumber swings up, out of the way — positive down-crowd boom starts cut fast, holds accurate grade. Want more facts? See your local Parsons distributor or write to us *today*.

The 155's close side-clearance puts trench within 21 inches of fences, poles, walls. Power-shift spoil conveyor dodges side obstructions. Belt-direction is instantly reversible, places spoil bank on either side of trench. Other Parsons sizes and types range from a small, rubber-tired Trenchmobile to large wheel-type "big-inch" and "middle-inch" Trenchliners.

mail today **PARSONS Company, Newton, Iowa** *for literature on 155 Trenchliner*

NAME_____ TITLE_____

COMPANY_____ DIV_____

STREET_____

CITY_____ STATE_____

Also interested in ☐ wheel-type Trenchliners ☐ rubber-tired Trenchmobile®

P794 GAS

PARSONS TRENCHLINERS®
A DIVISION OF KOEHRING COMPANY

dent (finance and accounting). He will be the chief financial officer of the company. E. A. BROWN is executive vice president (operations). Formerly vice president in charge of exploration and gas supply, Mr. Brown now is in overall executive charge of operations. WILLARD G. WIEGEL, former treasurer and director of personnel, is now vice president (personnel). He will continue as treasurer. The new post of vice president (research and development), goes to THOMAS S. BACON, former director of research and development. CARL M. HILL also is a new vice president in charge of exploration and gas supply, the post formerly held by Mr. Brown. Mr. Hill has been serving as superintendent of operations in the exploration and gas supply division. HOWARD J. YONKERS, assistant comptroller, was elected comptroller. The six men also were elected to similar posts with Lone Star Producing Co., wholly owned subsidiary.

Louis James
Lone Star

E. A. Brown
Lone Star

Willard Wiegel
Lone Star

Thomas Bacon
Lone Star

FRANK C. SENIOR is manager of the development section of the engineering and construction division of Koppers Co. Inc., Pittsburgh. Mr. Senior formerly served as a sales-service engineer in the division's Freyn department.

ROBERT K. LEVEY, customer service director of Mueller Co., Decatur, Ill., has retired after nearly 30 years of service.

DON A. BECKENBAUGH has been promoted to the newly created post of sales and manufacturing administrator of J. I. Case Co., Racine, Wis.

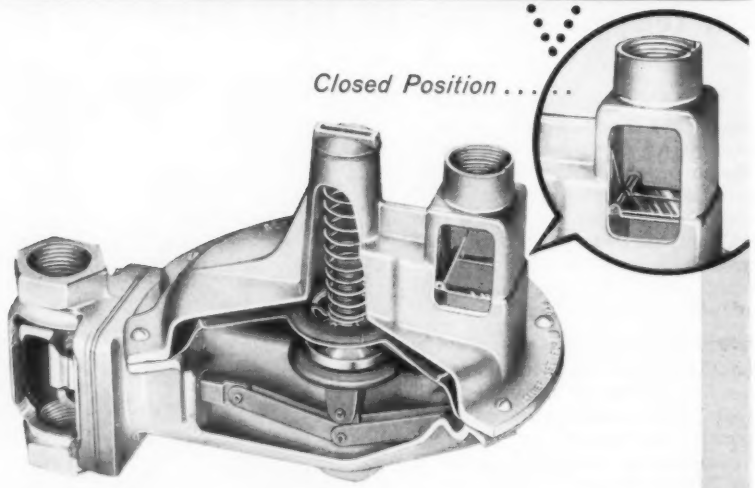
PHILLIP L. TAYLOR is now division manager of the newly acquired Greenfield division of the Berkshire Gas Co., Pittsfield, Mass. Mr. Taylor, formerly a special representative in the sales department, joined the company in 1956.

ELISHA GRAY II, president of Whirlpool Corp., St. Joseph, Mich., has been named chairman of the board. He will continue as chief executive officer of the company. ROBERT E. BROOKER, vice president of Sears, Roebuck & Co., was elected president of the company. CHARLES H. KELLSTADT, president of Sears, Roebuck, and ROBERT C. UPTON, vice president of Whirlpool, were elected directors, enlarging Whirlpool's board from nine to 11 members.

JOHN W. WILLIAMSON, general manager of the Kansas Power & Light Co.'s natural gas department,

REYNOLDS *trouble-free and accurate*

INTERNAL RELIEF VALVE



This new Reynolds relief valve has a double action sealing effect which permits the use of a large relief valve orifice which still seals and relieves within close regulation.

An Automatic quick opening flapper for excess pressure gas and yet has standard small vent opening for normal regulation.

The all stainless steel construction flapper valve eliminates high shock-lock off common to other type regulators.

Also available on NRT8010 series No. 1 Model 10, No. 1 Model 20, and No. 1 Model 30 series.

GAS CONTROL SINCE 1892

Not Shown—A Complete Line of Outside Vent Protection

Write for detailed information

REYNOLDS GAS REGULATOR CO.

ANDERSON, INDIANA

Carl Hill
Lone Star

Howard Yonkers
Lone Star

has been elected to the company's board of directors.

CHARLES G. THOMAS has been promoted to acting manager of purchases by Dresser Manufacturing Division, Dresser Industries Inc., Bradford, Pa. Mr. Thomas succeeds ROBERT D. CRANE, who has been named assistant director of purchases for Dresser Industries in Dallas.

JAMES E. BUTLER has joined Ridge Tool Co., Elyria, Ohio, as manager of sales promotion.

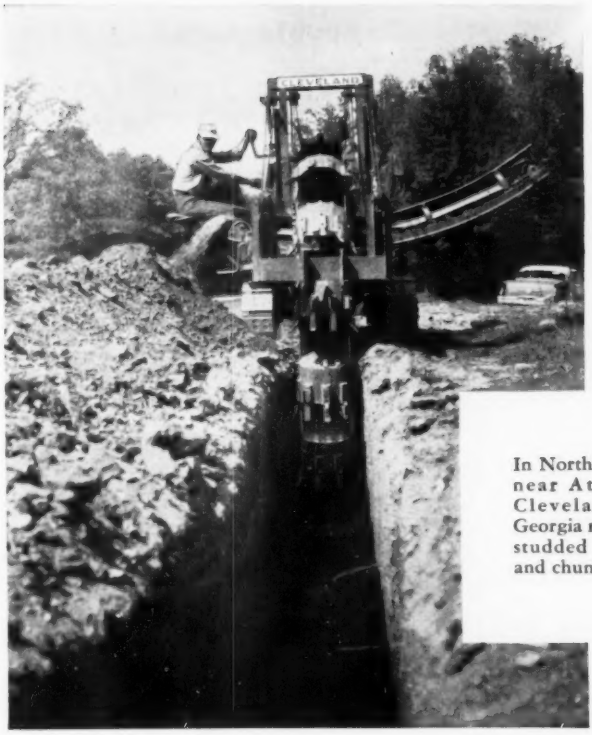
C. WALLACE CEDERBERG has been elected a director of the Brockton Taunton Gas Co., Brockton, Mass. Mr. Cederberg, treasurer, general manager and director of Larson Tool & Stamping Co., formerly was a director of the Taunton Gas Co. prior to the merger in 1952 with the Brockton Gas Light Co.

ROBERT W. ARMSTRONG has joined Whirlpool Corp., St. Joseph, Mich., as manager of public relations, RCA Whirlpool appliances. He will direct and coordinate all public relations and publicity activities relating to appliance sales, advertising, merchandising, and promotion. RICHARD W. SIERK, formerly air conditioning advertising and sales promotion manager, has become assistant manager of public relations.

THOMAS PAXTON, president of Southern Textile Machine Co., has

James Butler
Ridge Tool

C. W. Cederberg
Brockton Taunton



In North Druid Hills near Atlanta, this Cleveland 95 digs Georgia red clay, often studded with quartz and chunks of granite.

nine Clevelands . . . never a failure in the field

"We have used Clevelands ever since 1946, when our company was organized," says C. V. Lanier, field superintendent for the Concrete Construction Co. of Atlanta, Ga., "and currently we are operating nine. Mechanically, we have never had a Cleveland halt in the field.

"We have encountered every sort of obstacle and have trenched through blue granite rock, sand rock, shale, stumps, on flat land and hilly, through all types of weather. Our Clevelands have been economical to operate, easy to maintain mechanically, adaptable to every terrain and simple to handle."

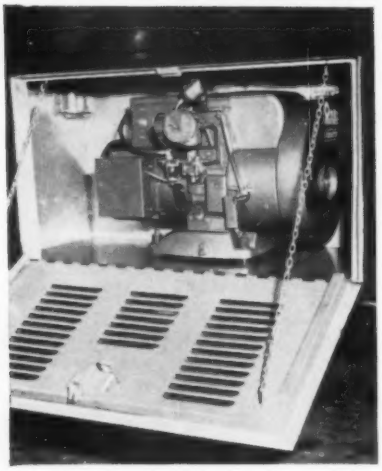
There's nothing like a Cleveland for trenching . . . accurate . . . fast . . . dependable . . . clean.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

ELECTRIC PLANT
NEWS



Charges truck batteries at far less cost... provides A.C. power, too!

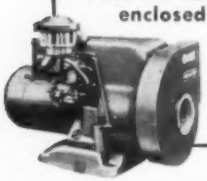
Before the dual-purpose Onan Electric Plant was installed on this maintenance truck, it was necessary to run the 160 H.P. truck engine to charge batteries used for communication. Now, the 2 H.P. Onan Electric Plant does the same job...saving fuel and engine maintenance.

The electric plant is an Onan Model 07AK-1R/972. It has an output of 750 watts A.C. or it can deliver 8 amperes for 12-volt battery charging. Plug-in receptacles are provided for operating electric drills, saws and other equipment used in construction and maintenance work.

Big savings reported!

One utility makes fuel savings alone estimated at $2.00 per day per truck. Another cites an annual saving of $800.00 per truck. This is based on battery charging output only. In addition, the A.C. output makes possible replacing hand tools with electric tools . . . saving time and money.

Vacu-Flo cooling permits enclosed installations



Vacu-Flo cooling is a low-cost optional feature on Onan air-cooled plants up to 10,000 watts.

Other Onan Models: 500 to 75,000 watts A.C., D.C. and Battery Charging

Write for folder showing 3 Packaged Power Systems

Onan
ELECTRIC PLANTS

D.W. ONAN & SONS, INC.
3034A University Ave. S.E., Minneapolis 14, Minn.

people • *Continued*

been elected a director of the Western Kentucky Gas Co., Owensboro.

BOYD N. EVERETT and PETER M. FLANIGAN have been elected directors of United Gas Corp., Shreveport. Mr. Everett is a vice president and treasurer of Continental Assurance Co. and Continental Casualty Co. Mr. Flanigan is on the board of Black, Sivalls & Bryson Inc.

Peoples Natural Gas Co., Pittsburgh, has promoted two men to serve as assistants to the general superintendent. They are LLOYD C. KING, a 40-year veteran of the company and former assistant superintendent of production and transmission; and GEORGE K. KLINE who since 1954, has served as western division manager.

HAROLD TILEY, formerly general sales manager, has been named to the newly created post of customer relations manager for Caloric Appliance Corp., Jenkintown, Pa. At the same time, HARRY J. LEVIN, formerly assistant general sales manager, was named sales coordinator. Caloric also has named JAMES A. KERR public relations manager.

ROBERT S. ELIAS has been named chief system gas dispatcher for the Columbia Gas System with headquarters at Charleston, W. Va. He succeeds SAMUEL A. CHADWELL, who retired on May 1 after nearly 46 years with Columbia and its affiliated companies. Mr. Elias joined the System in 1937 as an engineering-clerk with Columbia Engineering. After World War II he was assigned to Charleston as assistant system gas dispatcher. In 1957 he was named system gas dispatcher.

G. J. MANAHAN, general sales manager of the A. P. Smith Manu-

Lloyd King
Peoples Nat

George Kline
Peoples Nat

LEAKAGE SURVEYS
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Robert Elias
Columbia

G. J. Manahan
A. P. Smith

facturing Co., East Orange, N. J., has been elected vice president. He will continue to direct the company's sales activities.

RALPH V. COLES, formerly in charge of the company's instrument division, has been named general manager of the eastern research center of Robertshaw-Fulton Controls Co., located in King of Prussia, Pa. Robertshaw also has appointed CHARLES E. SMITH national service director. He will headquarter in Richmond, Va. D. REX SCOTT is the newly appointed manager of planning. JOSEPH A. MC CABE has joined the Bridgeport Thermostat division of Robertshaw as a sales engineer.

Three new officers have been named by Crane Co., Chicago. Elected vice president for sales was W. O. BROWN, who has been general manager of sales since January and before that was manager of the company's West coast sales district. K. L. KARR is the newly elected secretary and general counsel. He has been secretary since 1951. E. E. WYATT, who has held a number of administrative posts, was named assistant to the president for administrative planning. Also announced was the election of MARK K. LOWELL as chairman of the board of directors. He has been a member of the board since 1933.

GEORGE J. KUEHNLE JR., director of community relations for Cincinnati (Ohio) Gas & Electric, has been elected a vice president. MILES J. DOAN, assistant treasurer, is now secretary and assistant treasurer. RICHARD H. RHEIM, a member of Cincinnati's legal staff, was elected an assistant secretary.

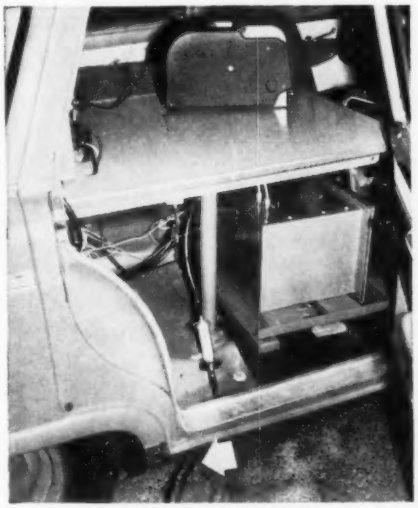
Several appointments were made recently by Iroquois Gas Corp., Buffalo, N. Y. GERALD J. GREENAN is a new member of the board of directors and will serve as secretary and treasurer. LOUIS S. REIF was

INFRA-RED MOBILE UNIT PICKS UP ATMOSPHERE SAMPLES AND INDICATES GAS LEAKS ON CHARTS

Developed by Heath Survey Consultants to Improve Securing of Gas Leak Data . . .

Interior of Heath Infra-Red mobile unit, showing chart on which gas leaks are indicated. Instrument operator marks street locations on chart as vehicle travels.

To improve the efficiency of present leak detection methods, mobile infra-red gas analyzers have been developed by Heath Survey Consultants, Inc. As the mobile units are driven along city streets or transmission lines, escaping gas is picked up by suction tubes which protrude from the vehicles. The presence or absence of methane is recorded on a strip chart. Use of the mobile equipment makes leakage control safety surveys more complete and more thorough than previously possible.



Close-up photo shows one of the pick-up tubes (arrow) extending below car. Above tube is dust filter for removing impurities in the sample.

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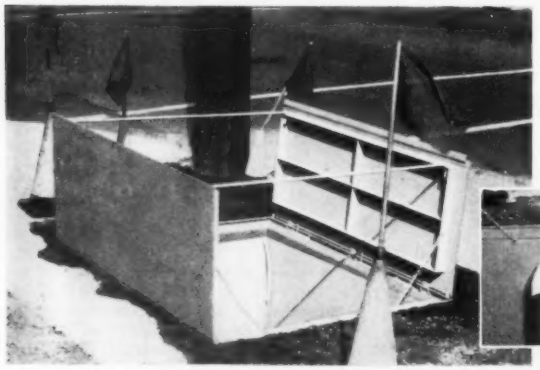

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elected a vice president, RALPH E. GRIMM was promoted to general superintendent, and LLOYD E. HAHN was promoted to superintendent of distribution. Also, ERNEST L. VARNEY was elevated to assistant superintendent and HENRY L. STEADMAN was promoted to staff engineer. DONALD M. DONALDSON, land agent assumes the post of assistant secretary.

JOHN H. MACKENZIE has been elected secretary and treasurer of United Gas Improvement Co., Philadelphia. He succeeds JOHN HOPKINS, who is retiring after 42 years with UGI and its predecessor companies. ALBERT W. TERRY was elected assistant secretary and assistant treasurer.

HOMER S. LANNING, treasurer of Greeley Gas Co., Denver, has been named a vice president. He will continue as treasurer.

Deaths

ALEXANDER J. DUAEI, founder and president of Pipe Line Service Corp., died recently in Hartford, Conn. He was 67. Mr. Duaei began his business career in Texas. He was associated with the Johns-Manville Sales Corp., where he was manager of public utility sales. In 1931, Mr. Duaei founded Pipe Line Service Corp. in Maywood, Ill. Within a few years the operation was expanded with a move into new facilities at Franklin Park, Ill. During the following years seven additional permanent coating and wrapping plants were erected throughout the U. S. Mr. Duaei contributed much toward the development of the entire industry, holding many patents used by equipment manufacturers, as well as coating applicators. In 1955 Pipe Line Service Corp. became a subsidiary of American Steel Foundries, but remained under the presidency of Mr. Duaei until his death.

J. J. DELANEY, manager of the Reliance Regulator division, American Meter Co., Anaheim, Calif., died on June 10, just as the July issue of GAS was going to press. Mr. Delaney was a long-time and well-known member of the Pacific Coast Gas Association. At the time of his death he was serving as vice chairman of the manufacturers section.

CLIFFORD D. COBBETT, a veteran of 28 years with Hill, Hubbell & Co., died recently of a heart attack at the Pittsburgh airport. Mr. Cobbett started out with Hill, Hubbell as a laborer in the company's plants, then located within Jones & Laughlin Steel Corp. at Aliquippa and Spang-Chalfant Corp. in Ambridge, Pa. He then became plant superintendent of these two plants and in 1945 he moved to the new Girard plant and became the plant superintendent there. In 1948 he became a district sales manager, the post he held until his death.

FRANK H. ADAMS, president of Surface Combustion Corp., died at his home in Toledo, Ohio, recently. He was 72. An active industry man, Mr. Adams served on many AGA and GAMA committees. In 1953 he was honored with GAMA's Distinguished Service Award as "one of the first persons to foresee the potential use of gas in industry." He also was a charter member of the Institute of Gas Technology and served for many years on the executive committee. Mr. Adams joined Surface Combustion in 1927 as vice president and general manager.

JOHN HARVEY, formerly representative for Parsons Co. in the north central district, is now the District 4 representative for the Newton, Iowa company. His territory consists of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahoma, Tennessee, and eastern Texas.

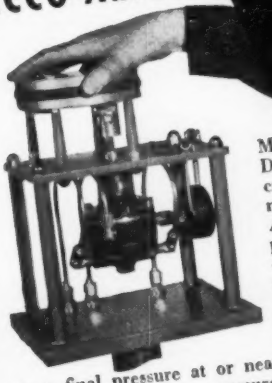
JOHN DERN, director and general counsel of American Natural Gas Co., and director of all of its subsidiary companies, died recently. Partner in the law firm of Sidley, Austin, Burgess and Smith of Chicago, Mr. Dern, 55, had been associated with the American Natural Gas system for many years.

WILLIAM J. GROVER, one of the merchandising pioneers in the field of automatic gas heating, died recently at his home in Maitland, Fla. Mr. Grover, who had been on leave of absence since 1956, was marketing director of Surface Combustion Corp., Toledo, Ohio.

CLAUDE L. DRAPER, 82, 26-year member of the Federal Power Commission, died in Washington recently. Mr. Draper retired from the FPC in 1956.

ARCCO

ARCCO-Anubis CONTINUOUS GAS SAMPLER



MEETING THE DEMAND for more accurate gas sampling, this newly perfected ARCCO-Anubis instrument replaces inadequate, inaccurate spot sampling methods. The Model 100-7 will over a period of seven days accumulate at a constant rate a sample of gas to a final pressure at or near 100 psig from a sample source, the minimum pressure of which is not less than 125 psig.

The ARCCO-Anubis design is based on the principle that maintenance of a constant rate of increase in gas pressure within a closed container, from zero to any selected maximum pressure, will result in a continuous rate of flow of gas into the closed container.

This is accomplished by means of a specially designed regulation system equipped with a precision drive mechanism so as to obtain a constant predetermined rate of increase in the outlet pressure into the sample container.

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CORROSION PREVENTION • Cont.

from page 18

or a voltmeter, with the proper technique, the IR drop in that length of pipe can be determined, and from it the magnitude of the current flow along the line. In order to do this with high precision, it is necessary to calibrate each individual section. This requires the permanent or temporary installation of a total of six leads. A fair approximation can usually be had, however, by using available data on the resistivity of the steel in the line.

The heavier the pipe, the greater the spacing needed for a given accuracy. An acceptable rule of thumb is to make the spacing between the two leads, in feet, equal to the four times the pipe weight, in pounds per foot. Thus the spacing for 28-lb pipe would be 112 ft. This rule gives a total resistance between leads of about 0.001 ohm, or a conductance of one ampere per millivolt.

Test points of this kind are useful for determining current distribution, for tracking down accidental contacts, and for making coating conductance studies. Some operators install them at 5-mile (approximate) intervals; some use them at every test point, with no single lead points at all. The line current test point can, of course, be combined with any of the preceding types. At crossing foreign lines, for example, a very useful type of test point involves a line current pair on each line on both sides of the crossing, plus the normal two leads at the crossing, or a total of 10 leads. This number of wires would usually be put in several boxes for convenience.

All line current spans should be installed on uniform welded pipe; never should there be any kind of valve, fitting, or attachment of any kind on the line between the two leads; nothing but straight pipe and welded joints. ■

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Washington • *Cont'd.*

from page 17

There are many that say that the price of gas will rise steadily for economic reasons anyway, and all the lack of corrective legislation will do is make it harder to get increases, make them bigger when they come as a hedge against the delays, and by forcing the price to lead the market slightly, cost the consumer more in the long run.

Some of the problems federal regulation of the independent gas producers will bring are beginning now to show up. One thing is certain—it's a lawyer's paradise.

Recently, the Federal Power Commission has been deeply embroiled in trying to decide under current regulatory laws and court decisions how to apply costs versus market price in setting prices for gas produced by independents.

Long, weary days of complicated oratory, duplicating many of the voluminous arguments on the same subject that have followed attempts to pass gas legislation in Congress, may force the FPC to do what Congress has failed to do—set up a basic criteria for judging these independent producer rates.

Increasingly, the commission is sinking deeper into full-blown regulation of the industry from wellhead to burner tip.

The Midwestern Gas-Tennessee Gas Transmission Co. efforts to bring gas from the Gulf coast to the Chicago area, and from Canada to communities north of Chicago, principally in Minnesota and Wisconsin, has been in the hands of the trial examiner for a recommended decision since May 5, the closing date for reply briefs in the consolidated competitive case.

Meantime, FPC has turned thumbs-down on a crash program to bring sizable additional supplies to the Chicago area in 1958, embodied in an alternate Midwestern-Tennessee Gas application supported by one of their opponents in the consolidated case, Peoples Gas Light & Coke Co. of Chicago. The FPC said the alternate plan was inconsistent with the original one in the consolidated case, and the record of that original case was closed; that Midwestern was not yet a "natural gas company" since it has not gone into operation, and thus the FPC lacked jurisdiction to issue a *temporary* certificate.

The turn-down of the alternate Midwestern plan put the outlook for the consolidated case back where it was Jan. 31, when hearings ended. That was, for a recommended decision by the examiner during the summer, and by the commission itself in the autumn or early fall.

Meantime, the turn-down apparently has not affected the peace talks of February which seemed to end the fight between Midwestern-Tennessee Gas on the one hand, and Peoples Gas on the other, over who should augment the Chicago area gas supply. News reports indicated both were dropping their opposition to the other's projects.

Midwestern has precedent agreements with Peoples Gas, Northern Illinois Gas Co., and Northern Indiana Public Service Co. providing for sale and delivery commencing in the fall of 1959 of up to 237

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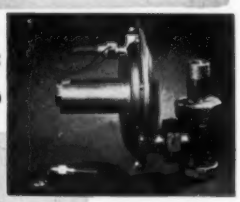

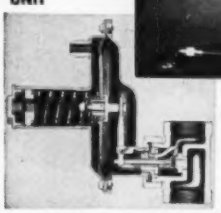

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Washington • *Cont'd.*

MMcf/day. (This includes the 115 MMcf/day of proposed sales to two steel mills by Midwestern in the consolidated case. Under the peace talks, these would be taken over by Peoples Gas and Northern Indiana, with Midwestern delivering gas on a wholesale basis only to area utilities.)

Midwestern has no application pending at this time covering these increased Chicago proposed sales.

The FPC staff in its brief filed with the examiner in the consolidated case opposed all the applications of the competing pipelines in the consolidated case. However, denial of all applications, as recommended by the staff, seems to be a very unlikely conclusion to the case in view of the growing impatience to receive natural gas service voiced by governors, U. S. senators, congressmen, state utility commission officials, newspapers, and mayors of the communities involved.

Another facet of the complicated matter was a ruling May 13 by the U. S. Court of Appeals for the District of Columbia, that the FPC had erred in the so-called Beatrice project of Peoples Gas, Colorado Interstate Gas Co., and Pacific Northwest Pipeline Corp. (shelved temporarily in December 1957 because of the Memphis decision) by not allowing the "competitive voice of Midwestern and Tennessee" to be heard.

The court, in reversing the FPC, footnoted that Peoples Gas and certain other defendants were indicted April 30 for antitrust law violation. (The others are Northern Natural Gas Co. and American Natural Gas Co.) One count accuses the firms of attempting to exclude Midwestern as a competitor.

However, the indictment against the companies and their officials is not a part of the FPC record in the consolidated case and will not be considered in deciding the case.

The charges, while not bearing directly on the questions confronting the FPC in the matter, could affect the way in which gas supplies for the Chicago area and the rest of the upper Midwest will expand. ■

GAS

PIPELINE SECTION

Southern Natural's off-shore system

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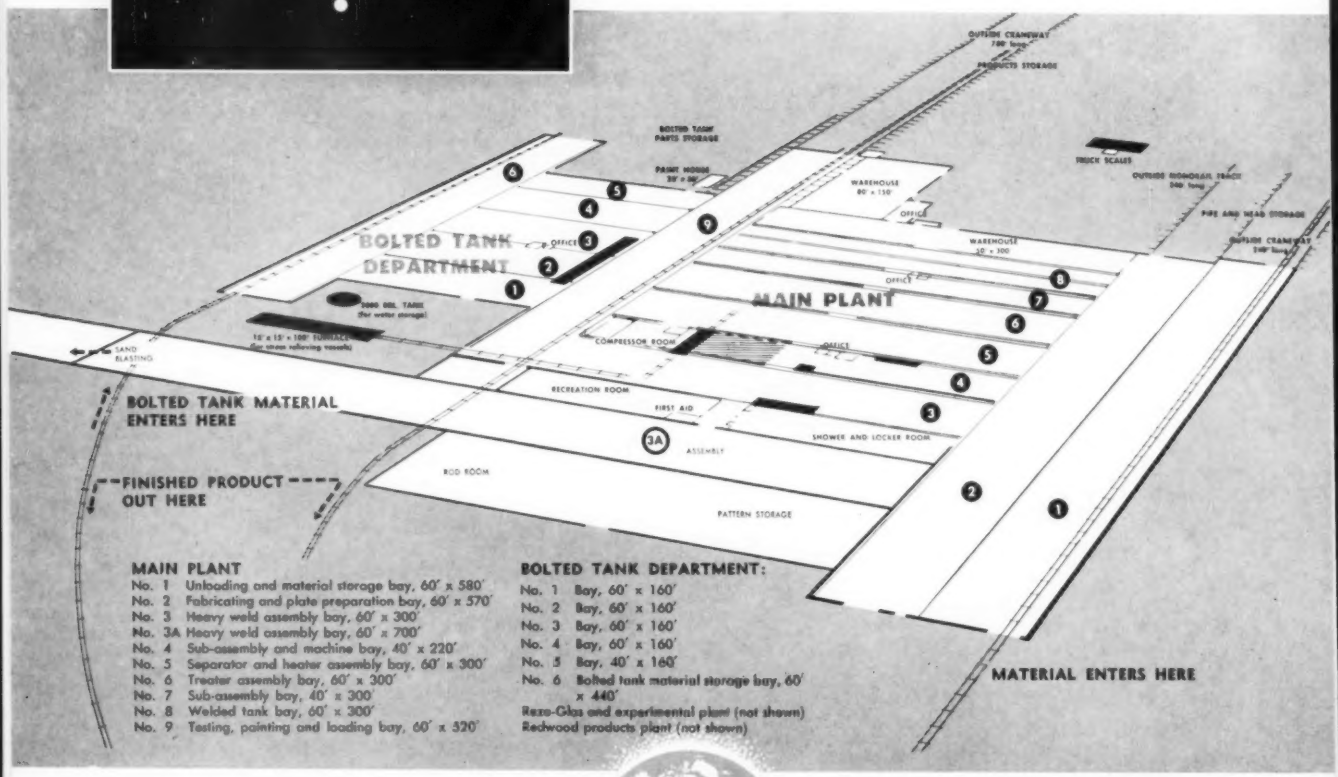

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No. 3 Heavy weld assembly bay, 60' x 300'
No. 3A Heavy weld assembly bay, 60' x 700'
No. 4 Sub-assembly and machine bay, 40' x 220'
No. 5 Separator and heater assembly bay, 60' x 300'
No. 6 Treater assembly bay, 60' x 300'
No. 7 Sub-assembly bay, 40' x 300'
No. 8 Welded tank bay, 60' x 300'
No. 9 Testing, painting and loading bay, 60' x 320'

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No. 1 Bay, 60' x 160'
No. 2 Bay, 60' x 160'
No. 3 Bay, 60' x 160'
No. 4 Bay, 60' x 160'
No. 5 Bay, 40' x 160'
No. 6 Bolted tank material storage bay, 60' x 440'

Rezo-Glas and experimental plant (not shown)
Redwood products plant (not shown)

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Southern Natural slushes through Louisiana swamps

By J. FRED EBDON, Editor

Moss-covered cypress tree in background typifies swampy lands of Louisiana Delta country. Shown here is a relief valve at Bayou Barataria measuring station.

BACK in 1929, Wall Street circles were questioning whether Southern Natural Gas Co.'s initial pipeline would ever be built. Depression economy was producing problems in spite of the soundness of the idea. The pipeline was built. The original system consisted of 1250 miles of pipeline and 15,000 compressor horsepower in three stations. The original delivery capacity was 100 MMcf.

Consider this beginning with the pipeline system that today has over 4000 pipeline miles; over 176,000 installed compressor horsepower; and a deliver capacity of 1 billion cu ft per day. This development represents high credit to all of Southern Natural's people. They kept their eyes to the future. And this well-established, mature natural gas pipeline company is still keeping its eyes to the future.

On March 3, 1958, the company filed with the Federal Power Commission an application for authority to expand its transmission facilities to increase system delivery capacity by more than 30 per cent. If this is approved, Southern Natural will pursue this 300 MMcf/day expansion program through 1958 and into 1959. The proposed increase, largest in the company's history, contemplates the expenditure of approximately $64.5 million and, together with expenditures to connect additional gas fields proposed in other applications now pending, would involve a total of $110 million.

Fig. 1 shows a map of the Southern Natural system. The area of the south Louisiana expansion program construction can be seen. The onshore and offshore country of south Louisiana is the scene of rapid ex-

Pontoons hold new pipeline in place in canal near Venice, La., deep in the Delta country.

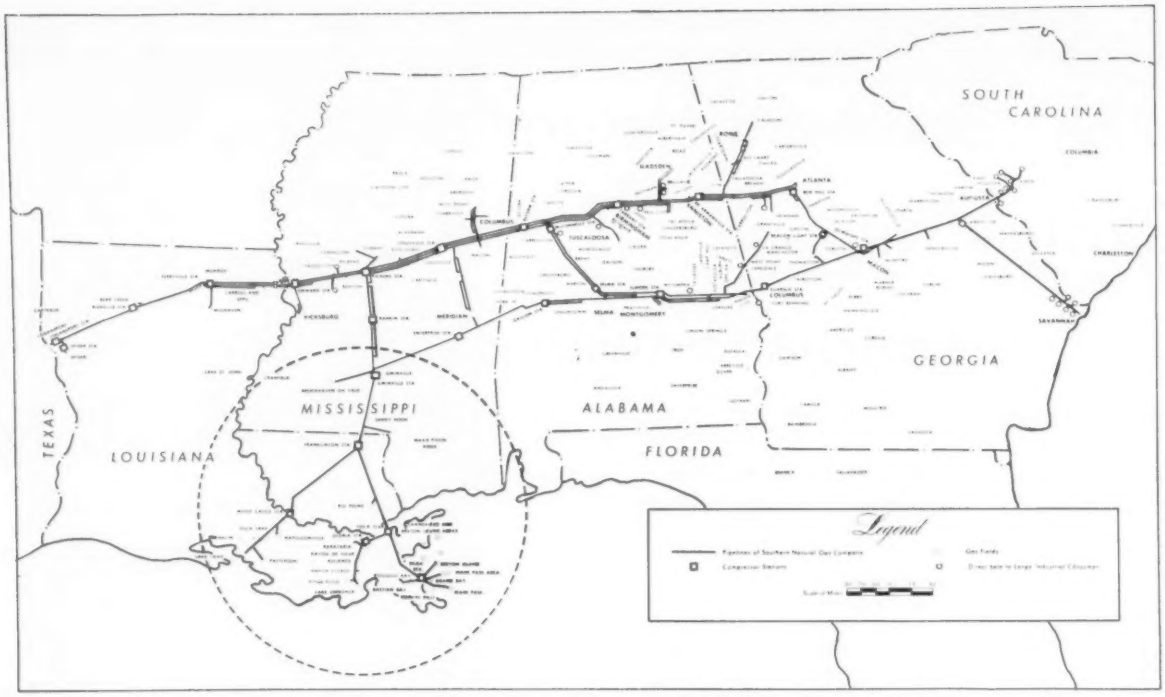


Fig. 1. Map of the Southern Natural pipeline system. Circle shows area of offshore production.

pansion activity that will connect needed new gas reserves.

Putting new gas reserves together at a price that can result in a profit, after the addition of transportation costs, is not the easiest thing in the world for a gas company to do these days. C. T. Chenery, chairman of the board of Southern Natural Gas Co., put it this way in an address before the New York Society of Security Analysts in mid-1957—"Before we can increase our pipeline capacity by 300 MMcf a day we must do several things.

"We should add 2 trillion cu ft to our gas supply. At 8 cents a thousand cu ft in place (and I have bid that price unsuccessfully for large volumes of gas), 2 trillion ft of gas is worth $160 million. To get possession of such an amount of gas by purchase, by contract, or by discovery, is an extremely difficult undertaking. However, we must solve this problem before we can obtain the approval of the Federal Power Commission for any substantial system extensions."

Southern Natural is looking to southern Louisiana gas reserves and is well along on the road with the solution of its problem. FPC Docket G-11234 was filed and approved to permit construction that will connnect two gas fields to the SNG system at a cost of $1.53 million. Docket G-12142 connects 10 gas fields (called the Phillips package) at a cost of $7.39 million. This work is being completed. Five more applications are pending: G-13082 was proposed to connect 12 additional gas fields in the Louisiana Delta country at a cost of $37.5 million. Dockets G-13203 and G-13379 are for connection of six and four new gas fields at a cost of $2.67 million and $2.6 million, respectively. Docket G-14560 for $886,000 and $214,000 will add one field each.

In 1957 a total of 1.3 trillion cu ft of new reserves have been connected and in 1958 a total of 1.6 trillion cu ft is proposed to be connected.

The cost figures used include the expense of installation of all facilities required—pipelines, compressor stations, controls, communications, measuring stations, etc. Looking at the south Louisiana section of the Southern Natural system, the pattern is Y-shaped with laterals and extensions fingering out through bayous, swamps, bays, rivers and open water of the Gulf of Mexico to gas fields in this lush producing area. The south Louisiana supply section feeds SNG's mainline system at Gwinville compressor station. This station repressured a maximum volume of 620 MMcf/day prior to expansion of the upstream system. It will be handling 850 MMcf/day after expansion.

South of Gwinville station by some 67.4 pipeline miles, at the apex of the inverted "Y" the south Louisiana section forms, is brand new Franklinton station. Gas from both major legs of the swamp-water section is compressed or recompressed at this unique plant. Southwest of Franklinton station on the western branch, a compressor station—White Castle—boosts field gas pressure from production of numerous swamp-land fields.

The eastern line has a compressor station at Toca, from which point the eastern leg "Y's" and laterals into natural gas fields in the Mississippi River Delta proper, and to nearby fields—both offshore and onshore. At Olga, an offshore, platform-based compressor facility has been constructed under the 1957 phase of the expansion program. Another station—Gloria

station—also pressures field gas fed into the main eastern leg of the Delta section system at Toca. It, too, was constructed under the 1957 phase.

The Southern Natural southern Louisiana system expansion started in 1957 and, carrying through 1959, is producing dynamic additions.

Pipelining in the marsh-water area of southern Louisiana is hard and expensive work. It is quite different from conventional dry-land pipeline building. Many of the techniques and much of the equipment is different. The people of coastal Louisiana are also unique.

Acadian descendants who populate much of the Mississippi Delta country and the rest of Louisiana's coastland, follow the traditions of their backgrounds pretty closely. Many families make their livings from fishing, muskrat trapping, rice and other farming, and oyster growing. The newest boom to their economy has been produced by the great variety of work oil and gas companies have had underway in southern Louisiana for the past few years. But, these landowners and residents do not appreciate pipelines that would cross carefully seeded oyster growing beds, disturb valuable muskrat trapping areas, or swing through highly productive shrimping or fishing grounds. So, in spite of the remoteness of the country, and its seemingly valueless appearance to the unschooled observer, there are often very difficult right-of-way procurement problems to be solved.

Route reconnaissance is best accomplished by helicopters, small pontoon-equipped planes (*Fig. 2*), marsh buggies, boats, etc. And, when survey crews take to the field, the going does not get any easier. A variety of transportation media may be used. The best underfooting walking-in parties can hope for is gumbo, and from there the situation goes from muck to a silt suspension in water.

Most of the ditching in Louisiana's marsh-water areas is cut with draglines. For marsh country, heavy timber mats or rip-rap may be used to support the dragline.

In more open water—across lakes and bays, etc., where the water is relatively shallow—ditching is done with a dragline that is barge mounted.

Fig. 2. One of Southern Natural's pontoon-equipped Cessna 180's.

Ditching is really not the word for it in the swamp and bayou country penetrated by much of Southern Natural's Delta section system. Actually, canals have to be dug and the pipe ditch cut in them.

If the operation is a traveling barge job, the lay barge must have flotation all the way. This means digging a pilot canal, a 40-ft wide by 6-ft deep flotation canal, and a pipe ditch. With this method, the lay barge—any barge or combination of barges producing a total length of from 220 to 240 ft or longer can be efficiently used—works at the head of the construction and moves out from under the pipeline as it is completed on the deck of the barge by an assembly line operation.

If the push method is used, the lay barge anchors at the mouth of the pipe ditch. This ditch can be considerably smaller in both dimensions as it does not have to provide flotation for the lay barge. The pipeline assembly line on the lay barge builds completed

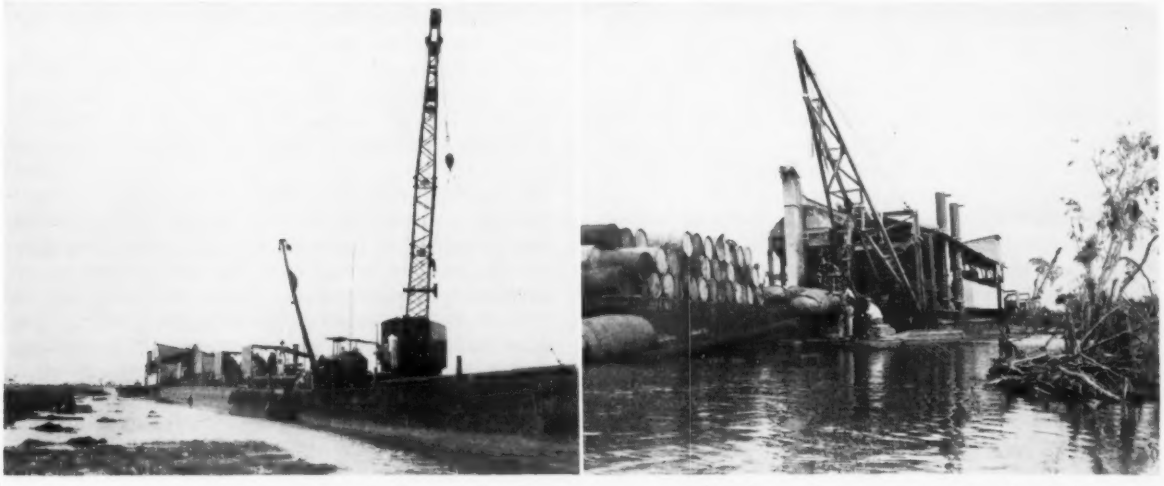


Fig. 3. Uncoated pipe (left) moves into the Brown & Root-Timcoat process, and (right) coated pipe comes out into the pipeline canal.

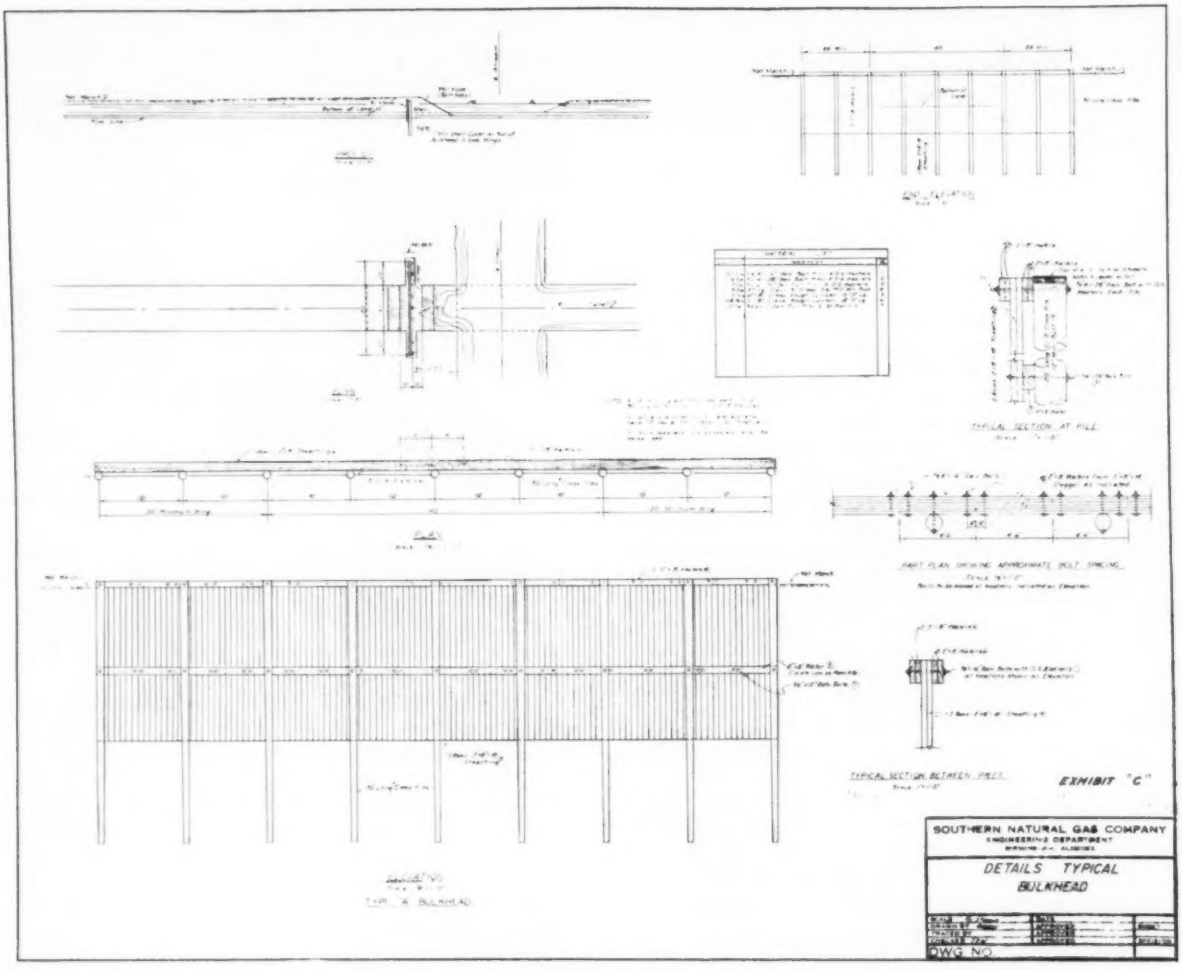


Fig. 4. Detail of typical bulkhead.

line on the deck, caps the end, attaches floats as and if needed, and launches it to float in the ditch. The barge remains stationary and as joints of pipe are needed, the completed string is pushed (sometimes pushed and pulled), joint by joint, on down the ditch. Miles and miles of pipeline can be laid with this method.

Southern Natural uses both the methods in construction to reinforce its south Louisiana supply lines system. And as is usually the case with pipelining, there are variations of these two methods that have been used.

Coastal and offshore pipelining in southern Louisiana is expensive. Southern Natural estimates that a 20-in. line (46 miles total length) into South Section 28 fields will cost $131,800 per mile. This construction is outstanding because it will be the first pipeline to brave the Atchafalaya River in the Morganza floodway. The floodway is a project by the U. S. Engineers to divert water around the New Orleans complex when the Mississippi River gets on a tear. Naturally, pipeline companies have stayed clear of this river and floodway project. Now, Southern Natural has designed well and will build through the heart of it.

Another example of the high cost of this type of pipeline is a 12-in., 21.5-mile, really offshore line to the West Delta Block 30 field. Average cost per mile is estimated at $82,900 for this 12-in. line.

One of the more unique features of Southern Natural's swamp pipelining is the use of a highly specialized lay barge, coating mixing, and application, pipe laying system. Brown & Root Inc. (Houston) and The Timcoat Corp. collaborated on designing and outfitting the barge. Actually, it is three barges, end to end (*Fig. 3*). This unit provides for every pipeline building operation from pipe storage, through welding, coating and lowering in. On the first barge, pipe is stock piled, and a crane and pipe-layer equipped crawler tractors handle the pipe and feed it to the construction line as needed. The second barge has the welding stations and welding inspection station. The third barge is the Timcoat processing barge that applies the combination weight—protective coating material and puts the pipeline to bed.

Timcoat is a coating system developed by Brig. Gen. P. H. Timothy (Ret.) for marshland and offshore pipelines. It is a mixture of rubberized asphalt and barite aggregates, impregnated with shredded fiber

Building Olga station compressor platform

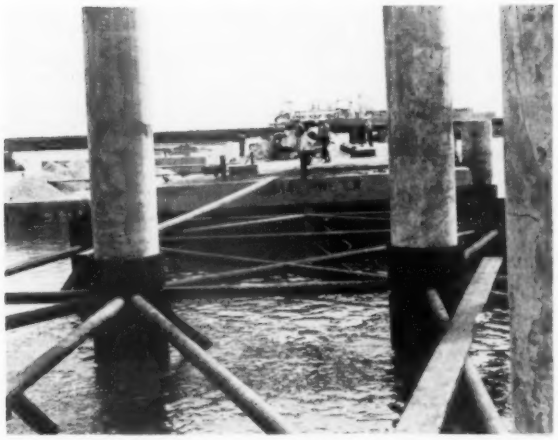


Fig. 5. A prefabricated piling template was used (above). Then, (top right) 112-ft pre-stressed concrete piles were set through the template. Pilings sank about 45 ft into the muck under their own weight, then (right) steam-powered pile-driving hammer took over.

glass. This tough, pliable coating has high resistance to shock and can produce electrical resistance in the order of 540,000 ohms/sq ft after months of submersion. Marine life does not care to nibble on it.

The Timcoat operation is a continuous, on-line process that is highly conveyorized and automated. Dry-mix — aggregate, filler, powdered asphalt, and powdered synthetic rubber—comes aboard via hopper barges. The dry mix is transferred to the process barge. Hot emulsified asphalt is added, bringing the temperature of the as-coated mix to about 260° F. The shredded fiber glass goes on just before the total mix is extruded on the pipe by a swage-shaped coating head. Water sprays cool and cure the coating as the pipe moves from the coating machinery to the launching end of the processs barge via a combination belt-roller conveyor. The coating is flexible enough to permit it to conform with any reasonable pipeline bending as the pipe is floated or lowered into the pipe trench.

Gen. Timothy developed the coating and process after working on some 200 miles of Southern Natural swamp and marsh pipeline in 1953. This line was concrete coated at a cost of 3.5 million. However, the complexity of the concrete process, its coated-pipe (314 lb/ft) handling problem, and the extreme difficulty of preventing the concrete from cracking or breaking off at any time the pipe has to be bent during construction, led him to ultimately develop the Timcoat material and method.

Since then, Timcoat has been "at home" on Southern Natural's swamp water lines. It was used extensively to coat new lines into that company's new gas fields in 1956 and on the work under the expansion program kicked off in 1957.

As pipelines cross the marsh grass and slush of southern Louisiana they cut through bayous, sloughs, ditches and canals. Some of these are of no importance. Others are most important to the landowners and residents. Some of the pipeline canals would let salt or brackish water into freshwater canals or lakes. This has to be prevented. And farmers, oyster growers, fishermen, fish and game conservation agents, and the U. S. Corps of Engineers all have an interest in these matters. The solution to this problem is construction of a plug or plugs where the pipeline canal crosses a body of water and it is desired to prevent

Fig. 6. SNG's construction department puts in a block valve assembly on a new line, connecting a gasoline plant in Toca station yard.

the commingling of the two waters.

Typical construction on Southern Natural's bayou country pipelines calls for plugging pipeline canals with a bulkhead, covered with shell and with sloped shell aprons on either side (*see Fig. 4*). Piles and sheathing must be creosoted to prevent accelerated deterioration. The wings of the shell-covered bulkhead extend beyond the banks of the pipeline canal onto the natural marsh on each side.

Construction of the line from Olga station to the Ft. Jackson and Bastian Bay fields meant crossing the mighty Mississippi River. The crossing was made by submarining two 12-in. runs at historic Ft. Jackson, near the mouth of the Mississippi. Traffic on the mouth of the river is extremely heavy. This did not help the river crossing any.

The crossing runs were welded in 90-ft sections on a conventional ramp-type lay barge. The 90-ft sections were then tie-in welded to the line previously lowered in as the lay barge was winched forward.

Southmost compressor station on the Southern Natural system is the offshore plant at Olga. The pipeliners are fond of saying Olga station is at the end of the United States. To find it you have to do some looking. And should you happen to know where it is, the only means of getting there are by water, or pontoon-equipped or amphibious planes.

The station is located on the eastern edge of the Mississippi river delta, near the mouth of the big-muddy, where the muck and swamp-grass drop into the Gulf of Mexico. Here a 12-in. line brings in gas from the offshore Breton Island field; another 12-incher moves gas from the offshore fields in Main Pass Blocks 46, 47, and 48; a 14-in. line connects the Romere Pass and the 16-in. line from the Main Pass Block 69 and other Main Pass fields; a 12-in. line transports production from the junction of the Ft. Jackson and Bastian Bay lines and an 8-in. line brings it to this junction from the Bastian Bay, West Bastian Bay and Ft. Jackson fields, and gas is taken from Coquille Bay through an 8-in. spur on the Romere-Main Pass line. Initially, Olga will repressure all of the natural gas from the Romere-Main Pass line to 950 psig (the other lines being operated initially at higher pressures), to start it on its trek to Toca station, Franklinton station, Gwinville station and on into Southern Natural's mainline system.

Olga is a platform station. Actually, four platforms are on this location. One is used for check metering equipment on the Breton Island line. Very close to the check meter platform, a receiving platform (for gas from other fields) has been constructed. Several hundred feet away from the check meter and receiving platforms is the main compressor platform. On the opposite side, and 150 ft or so away, a compressor auxiliary platform has been fabricated. A structural-steel personnel bridge connects the compressor and compressor auxiliary platforms. Piles will carry both piping and a personnel walkway between the compressor platform and the receiving and check metering platforms.

To construct the receiving, compressor and auxiliary platforms, the contractor, J. Ray McDermott & Co. Inc. (Harvey, La.), moved in its huge steam-crane barge—Barge No. 6. A piling template was fabricated (*Fig. 5*). Then, 112-ft prestressed concrete piles were set through the template. The piles sank about 45 ft into the muck under their own weight. The crane barge's pile-driving hammer took over from there and beat them down to the point that put the bottoms of the pre-cast platforms 18 ft above mean sea level. The piles did not found on solid understrata. They are held by surface friction alone.

Scope of these platform-building operations is hard to get from the accompanying pictures. The crane barge, for instance, is mammoth and has complete work facilities; machinery, tackle, shops, etc. A crew quarterboat (living accommodation barge) is part of it. The quarterboat has complete living facilities—bunk rooms, recreation room, washrooms, etc., and galley and mess hall. Large refrigerated rooms hold adequate supplies of meats and perishables for a comfortable period. An average lunch would include all the steak you can eat, green beans, lima beans, spinach, salad, the inevitable Louisiana rice and gravy, rolls and bread, three different fancy pastries, huge slabs of pie, and all the milk and cold drink you can handle. And, the steaks were good too, thanks. The meals are all out of proportion to what even notorious free-loading editors can eat. But, it offers variety, and hard work in the salt-wind swept open-water area produces some generous appetites.

Fig. 5 can give an idea of the size of the project. The crane has a 112-ft long concrete pile lifted in the air and ready to go in the template. Remember, all equipment and supplies have to be barged in—about a 2-hr trip in a fast personnel boat, much longer via a tug-powered barge.

After the piles were set in the muck, prefabricated platform floors were lifted off barges and lowered with great skill onto the piles and tied-in. Next comes all of the pipe, fittings and equipment that form the link

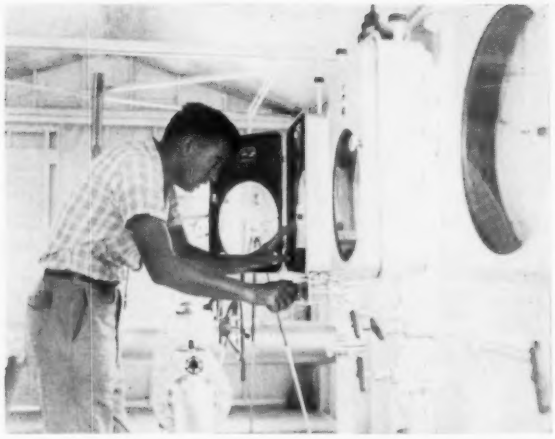


Fig. 7. Some of SNG's measurement stations are on dry land. These two pictures show exterior and interior views of the Bayou De Fleur station. (See below.)

between these waterbound structures and natural gas pipelines.

The engines on the Olga station platform are two Cooper-Bessemer GMXD-10, 660-hp, reciprocating engine-compressor units. They are skid-mounted and were packaged into compressor plants by Southwest Industries Inc. (Houston).

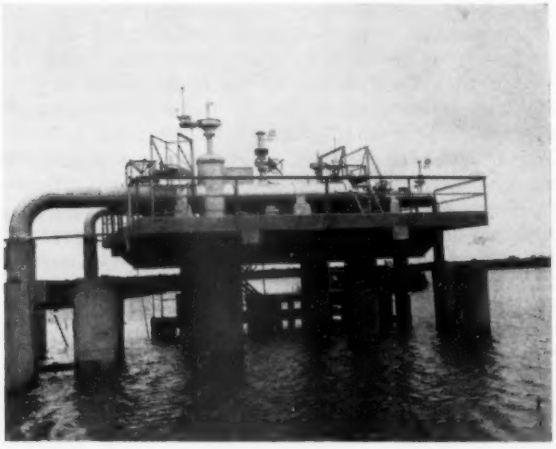
Southern Natural faced three possibilities for the operation of this station. First, it could have been designed for attended operation and, second, it could have been designed for unattended, remote operation. And, as the third choice, it could have been designed for unattended, local automatic control.

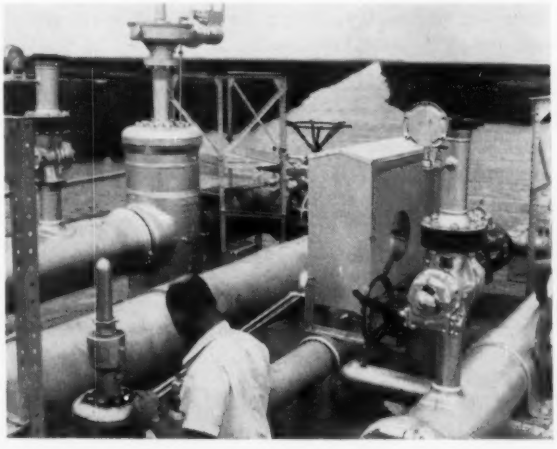
The local automatic operation was rejected as the engineers felt it would not offer the reliability and flexibility needed for transmission work, although it is recognized that this method is very adequate for field and gathering line compressor plants. Such local control does not permit the complete integration with the pipeline system that affords changing compressor operations in direct relation to near and far system conditions.

If attended, the platform would have to be large enough to hold complete living facilities for station personnel as well as the plant equipment. Two or three men, at the least, would have to be on the platform at all times working 12-hr shifts. The Olga area is remote, flat and generally dull. A person living out there for three or four days at a time would not find the duty stimulating. Too, hurricanes and lesser storms would mean evacuation for the crew—often dangerous in itself—and the station would have to be shut down until the weather blew past. So, Southern Natural rejected attended operation on the basis of problems to personnel welfare and morale.

That left only remote-controlled operation, and they have designed on this route. Olga station is controlled from Toca station some 42 miles away. It uses a remote-setting automatic system. Southern Natural's study indicated that initial capital investment for the remotely controlled station would be about 16 per cent more expensive than for attended operation, but remote operation would produce operating cost economies that would pay out on the increased initial costs within a maximum of three years.

Then came the decision in selection of communications and data transmission media. Microwave radio was elected over submerged cable on the basis of:





. . . Others are on platforms such as this one at Olga.

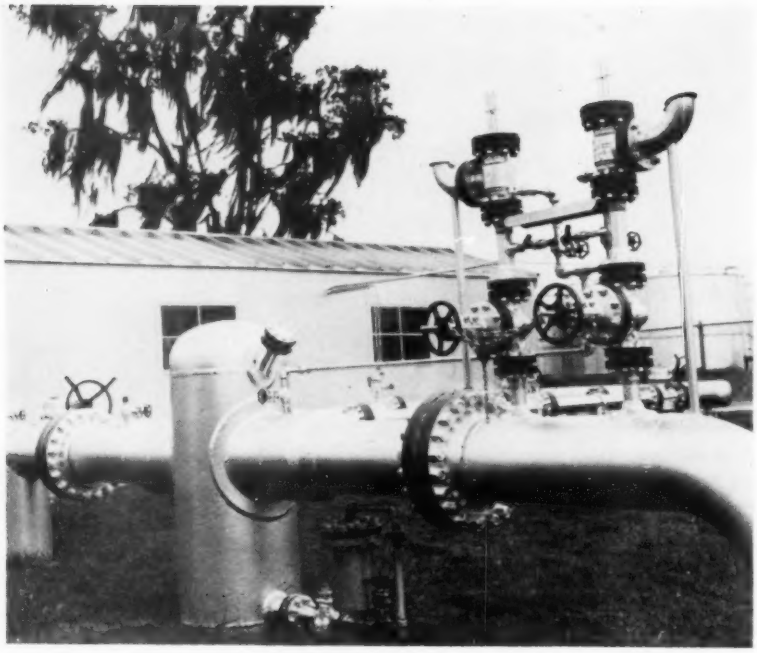


Fig. 8. Relief valves and separator at Bayou Barataria receiving station.

1. Lower cost based on having the same number of circuits available in the cable as is available in a microwave system.

2. Lower maintenance cost for the microwave system as compared with 42 miles of submerged cable in brackish and salt water.

3. Liability of damage and breaks to the cable in a canal, and the time and difficulty involved in restoring service after such events.

Therefore, a General Electric microwave system handles communications, data transmission and control signals to and from Olga station. The system makes the 42 miles in two 25-mile hops. The repeater station is near the paved highway running between New Orleans and Venice, La., so it and one terminal station—that at Toca compressor station—are readily accessible.

The compressor units are equipped with Cooper-Bessemer automatic control panels for programmed start-stop sequencing. Every known trouble detecting and protective shutdown device is included in Olga's compressor unit control design. Southern Natural considers these control devices and systems quick acting and reliable.

Telemetered and controlled functions will be coded, transmitted, and received as signals of different frequencies with equipment made by Controls Corp. (Minneapolis).

This equipment on the Olga station terminal end will produce the electrical impulses into the C-B control panels which will operate the mechanical and electrical devices that actuate valves, break circuits, raise or lower the settings of variable functions, trip protective devices, etc.

For either major maintenance or repairs, maintenance men will have to make a long boat trip out to Olga. Minor repairs will require the same or a short hop by plane, weather permitting. However, even if the station was manned, damage, major parts replacement, or heavy maintenance would still necessitate extra personnel and the boat trips.

So, the marshes out at Olga are filled with the throaty chugging of the compressor engines, humming away to themselves as they push offshore gas into a vast pipeline system. French-speaking shrimpers are lulled to sleep in their shrimp boats that line nearby bayous and passes at night by the engine throbbing of Olga station. They do not realize or appreciate the fact that the logic operating this facility originates 42 miles away.

Toca station, though not new, will get some face lifting under Southern Natural's expansion plans. The first step was the installation of two additional compressor units. Those installed were a pair of Ingersoll-Rand, 660-hp, SVG-12, skid-mounted reciprocating units. And the control center for Olga station went in at Toca.

The pipeline from Barataria gas fields and the 20-in. line from the Main Pass and other fields has been tied-in with Toca station by the construction of 180 ft of 20-in. suction-side line to a new separator and continuing 1860 ft to the tie-in to the lines to both deliver and take gas from a proposed nearby natural gasoline extraction plant to be owned and operated by Texas Natural Gas Corp. This line is laid in soil that produces an average corrosive climate expected in southern Louisiana—it would be classed as severe in other parts of the nation. The entire 2000 ft has been coated with Polyken tape. Tape was applied with a 4-in. overlap; a felt wrapper was applied over the cold-applied tape.

The work at Toca station was done by Southern Natural's construction department, using its own construction specialists and pipelining equipment (*Fig. 6*). Their only problem was the muck and slosh

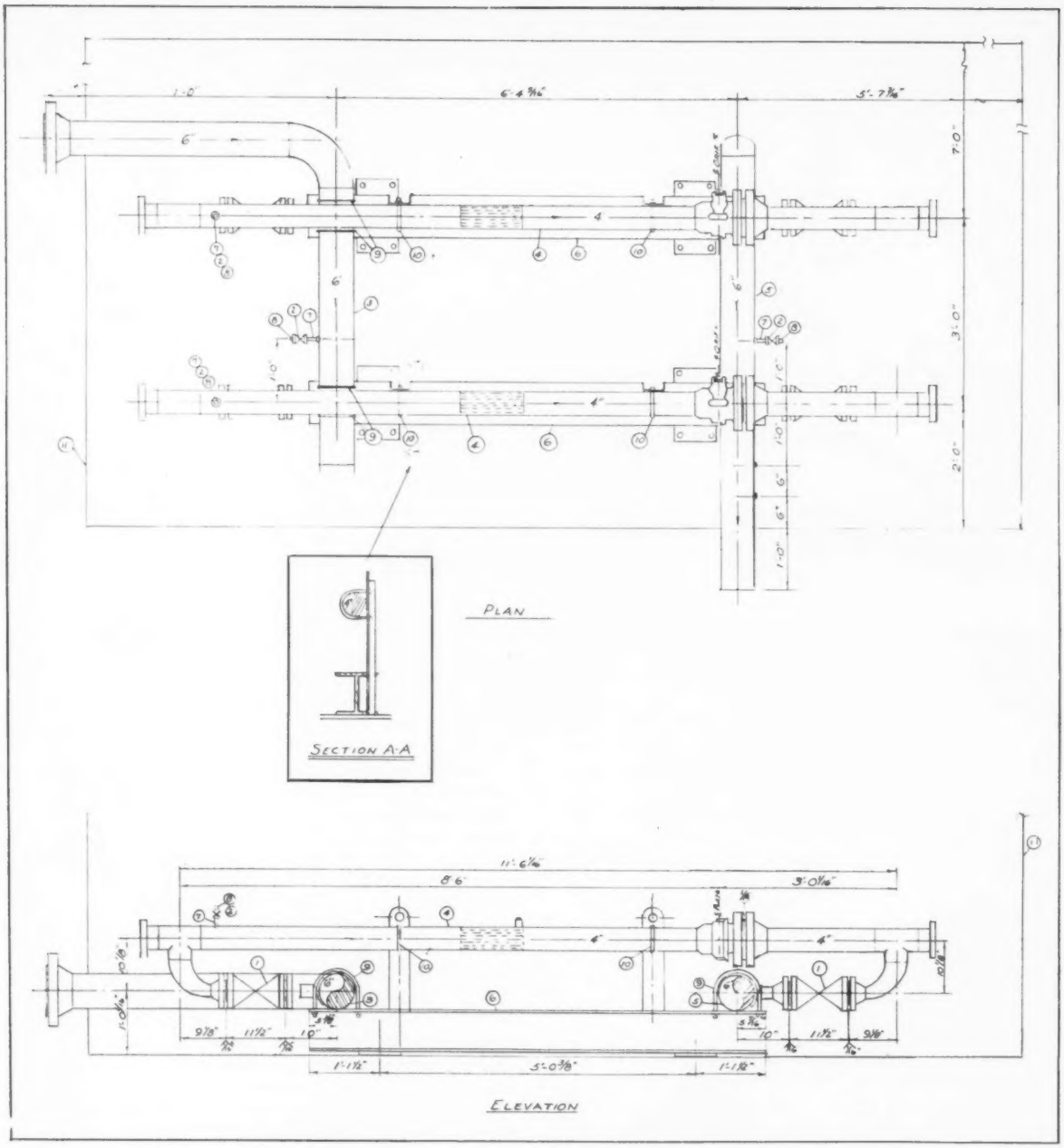


Fig. 9. Design of typical skid-mounted metering station.

that you always are up against in this lush, damp area.

To the southwest of Toca station, on the New Orleans-to-Venice highway, some 20 miles from New Orleans, a new compressor station—Gloria—has been constructed. This is essentially a field compressor plant that will pressure gas taken from the Lake Enfermer and Barataria lines. Two Ingersoll-Rand, 550-hp, 10SVG, skid-mounted reciprocating units have been installed—one to compress gas from the Lake Enfermer line, the other for the Barataria line gas. Station piping has crossovers and valving for switching each engine, and both lines can be valved to flow gas into either suction header.

On the western leg of the big "Y" in Southern Natural's south Louisiana supply system, White Castle station has been enlarged by the installation of another 550-hp compressor unit. It previously had 1100 hp in operation, a total of 5500 hp is ultimately planned.

Franklinton station, at the root of the "Y" in Southern Natural's south Louisiana supply system, has been added to the system under the '57-'59 expansion plans. It has eight, 660-hp, Cooper-Bessemer GMXD-10, skid-mounted engine compressor units. Five of these compressors pressure gas from the eastern lines, and three handle gas from the west leg. Piping

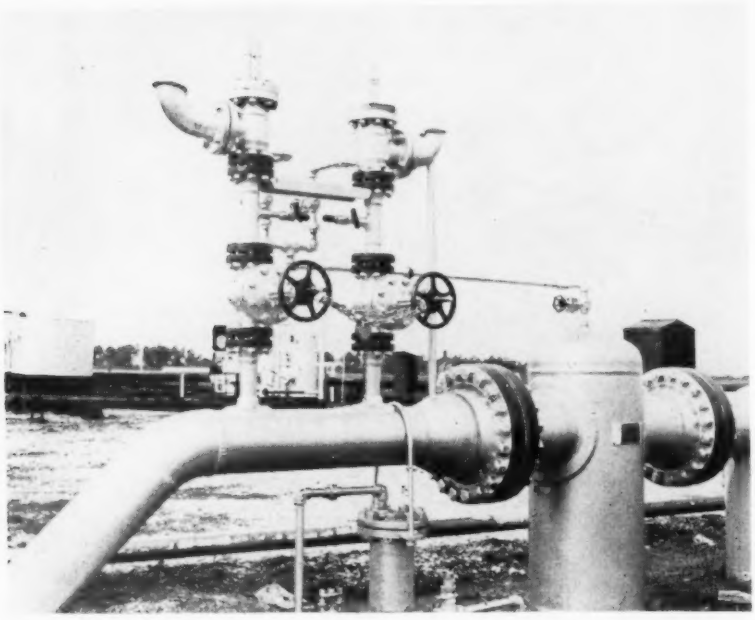


Fig. 10. Relief valves and separator at Bayou DeFleur measurement station.

and valves have been installed to permit three of the units to compress gas from either branch of the "Y." Ultimately a total of 9240 hp will be installed at this station.

The station is designed for semi-automatic, local control. Control center is on-site, centralized about 150 ft from the main engine room. Each engine has a Cooper-Bessemer control panel designed for push-button, preprogrammed, start-stop sequencing. The engine-compressor units are equipped with the latest in safety and protective automatic controls. Should one or more of these devices operate, indication of the trouble and location appears on the unit's panel.

• Measurement in marsh and offshore areas

The Louisiana marsh and offshore environs offer problems to the measurement department over and beyond those associated with their operations on dry land. Some of the measuring stations in Southern Natural's south Louisiana supply system are on dry land. Others are on platforms (*Fig. 7*). But regardless of the installation point, they produce problems in accessibility and transportation. This is one of the main metering difficulties.

This section of Louisiana is interlaced with canals and bayous. If one is going by automobile to a measurement station or is driving between stations, the route by road might be 20 or 30 miles even though the stations are nearly within sight of each other. And if the route crosses a major bayou or the Intracoastal Canal, chances are a drawbridge or two will be up. This usually results in a delay of a few to 30 minutes. So, the number of stations that a chart changer, for instance, can make in a day is definitely limited even when the stations are on "dry" land.

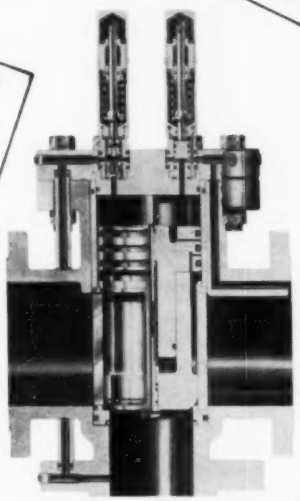
Other stations are best accessible by boat or by a combination car and boat trip. In these cases, the weather plays a part. Squalls or storms may delay the boat trip from an hour to several days. At other times one can leave the boat dock in good weather but encounter a squall while en route or arrive at the meter station platform only to find the water too rough to make a safe transfer of personnel.

By far the best method of transportation—weather permitting—is by plane. Southern Natural has a float-equipped Cessna 180 assigned to the measurement department. This craft can land nearly anywhere in Delta and coastal Louisiana. All it takes is minimum clearance and a few inches of water.

For instance, the trip from Toca station to SNG's production metering station at Bayou DeFleur takes several hours by car and boat. Yet, with a Cessna float plane, the trip requires only 14 minutes from take off at Toca to landing on Bayou DeFleur. Southern Natural takes natural gas production from the California Co. at this station. Then, to hop over to Bayou Barataria receiving station (*Fig. 8*) takes only three minutes in the small amphibian. But, by boat and car it takes over one hour and 20 minutes. It is obvious how the plane can efficiently move key measurement personnel around in this country for routine and emergency inspection, maintenance and repair. Over open water, helicopters are the best as planes cannot take on heavy swells and mean choppy conditions.

Southern Natural uses single meter runs for measuring up to 5 MMcf/day. However, these are few and far between in this good producing country. Most of the measurement stations on the south Louisiana supply system have dual orifice meter runs with dual meters on each run. Eight-day clocks are pretty standard.

The measurement department has designed a skid-mounted, standard meter station that can be installed with minimum cost and trouble. They estimate that these stations save about 40 to 50 per cent for initial



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capital investment and installation. *Fig. 9* shows a typical example of these standard, prefabricated meter stations. This one went into the Main Pass receiving station that takes production from fields in offshore blocks 46, 47, and 48. It has twin 4-in. meter runs equipped with Daniel Junior orifice fittings. Inlet and outlet headers are 6-in. Inlet and outlet valves are four 2-in. Crane gate valves. Check riser valves are four ½-in. Rockwell lubricated plug valves. This assembly weighs about 2500 lb. A standard skid-mounted unit with twin 6½-in. meter runs weighs about 5000 lb.

The standard metering stations are usually assembled at job shops. Then, Southern Natural personnel clean them to base metal and apply a good prime coat of zinc based primer (Demetco or other) prior to adding the aluminum coats. They are then trucked to the station or to a boat landing for water transportation to the platform or island on which they are usually installed.

At some locations Southern Natural has to build its own measurement platform. Other installations are installed on drilling or production platforms owned by others, or on relatively high ground or islands. In any case, the metering runs are elevated above expected water levels, so it is imperative that the runs and other piping take a very minimum of space. The piping is unique for each station as scrubbers, check valves, etc., are required in some instances.

Both mercury and dry meters are used for Southern Natural's south Louisiana measurement operations. Both have advantages, and disadvantages, depending on specific conditions. Freeze-ups from hydrate formation, and the severe corrosive climates are certainly problems. Gas pressure at the platforms may average between 800 and 1200 psig to move the gas miles into a compressor station. Hydrates form around 70° F at such pressures. The only criterion for protective coating maintenance on above ground lines is to clean and paint 'em before they rust.

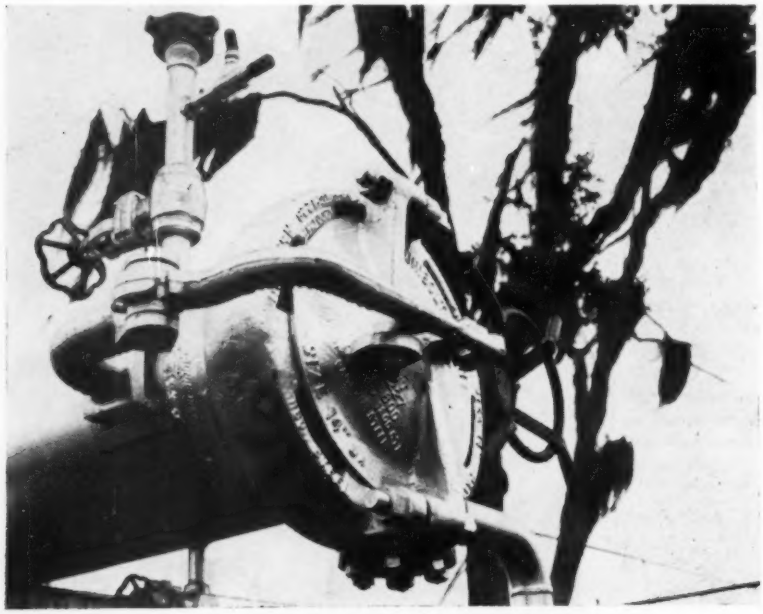
Most of SNG's marsh and offshore stations are visited once a week, and often twice a week. This means lots of work for the planes and boats. The measurement department plane is based at LaCombe, La.—on the northeastern shore of Lake Pontchatrain. It is but a 10-minute flight from there to a landing at New Orleans airport to pick up measurement or other personnel. From there it is a 20-minute hop to a water landing on a ditch at Toca station. Many other measurement points are similarly reached in little more or less time.

But, boats are still the mainstay, particularly where any but the lightest equipment is involved. Such trips can take several hours to days. And it means many early 4 or 5 a.m. starts for personnel.

The Bayou DeFleur production meter station is typical of the onshore, marsh location meter stations. Gas from the California Co.'s field compressor comes into the SNG station through a 6-in. line, protected by twin Garrett relief valves mounted in parallel. A Peerless scrubber then cleans up the gas before it passes through the dual meter runs (*Fig. 10*). Daniel Junior orifice fittings are used. Inside the building there are four American, mercury-type differential meters (two for each run due to the remoteness of the station) and an ARCCO recording gravitometer.

So, swamp and offshore measurement operations do produce some unique problems while not missing any of the problems encountered on dry land. The measurement stations must be pretty well self sustaining. Good design and maintenance produce reliable measurement for Southern Natural.

After visiting SNG's south Louisiana supply system pipelines and facilities, one comes away with the impression that coastal and offshore Louisiana is no place for a pipeline system. But, more important, it also shows the extent of effort and expenditure a natural gas pipeline company will invest to assure adequate service to its industrial and utility customers. ■



Large moss covered cypress tree makes an interesting background for this picture of a pig trap at Bayou Barataria measuring station.

Biggest pipeline bridge along Westcoast line is this one over Peace river—1675 ft in length.

Remote locations do not hamper operation of Westcoast stations

By JAMES JOSEPH

PART TWO OF A THREE-PART SERIES

GAS exclusive

FROM the deep recesses of virgin timber near Fort St. John, British Columbia, comes the throaty roar of mammoth engines, a seeming misplacement of horsepower in this, a wilderness once the exclusive domain of bear and beaver.

Compressor Station No. 3—and its four 3550-hp Nordbergs—is on the line.

The "line," of course, is Westcoast Transmission Co. Ltd.'s 650-mile, 30-in. pipeline which taps British Columbia and Alberta gas fields, and delivers 300

Front of Station No. 5 near Australian, B. C., showing 24-in. suction line and gas scrubbers. Note concrete partition between engine-compressor section (left) and rest of station.

MMcf/day to Huntingdon, B. C., near the U. S. border.

Compressor Station No. 3 and its two sister "downstream" booster stations—downstream from initiating Station No. 1 at Taylor, B. C.—have much in common.

All center around 3550-hp Nordberg high-pressure, V-type, FSE-1316-HSC, four-cycle, 16-cylinder gas engines (with a bore of 13½-in., a stroke of 16½-in.), driving DeLaval BLV-24x24, single-stage centrifugal compressors—the compressors driven through single-step speed-increasing gear with 10:1 ratios.

All pre-warm their super-charged engines' intake air (via American oil-bath filters) through jacketed exhaust silencers (Kittell), a booster-station novelty.

All operate centrifugal compressors (unlike station No. 1's reciprocating units).

All are designed for cold weather—their compressors, auxiliary equipment and station utilities housed in a single building (and its basement). Only other building is a combination garage-shop, which also stores raw and tested water.

And all, even by Stateside booster station standards, are remotely located. Almost wholly self-contained, each generates its own electricity, pumps its own make-up, domestic and cooling water. Typically, Station No. 3's two Layne & Bowler deep turbine pumps—driven by 25-hp Wisconsin gas engines—tap the plant's own wells.

Station No. 7, at Mile 484 along the line, varies only in number, not type, of engines. Unlike Stations Nos. 3 and 5, which operate four Nordbergs, Station No. 7 has but three.

Moreover, within these three downstream station's work fully 39,000 hp of the line's total 52,500 installed horsepower. Four additional downstream stations, already in planning, will boost Westcoast's delivery capacity to 660 MMcf/day and may come close to doubling its compressive power.

Closeby Lake McLeod and 90 miles north of Prince George, B. C., Compressor Station No. 3 is firmly astride some of the world's best hunting country—a near-virgin wilderness which, though cut by the nearby Hart highway, the pipeline's right-of-way and just now being penetrated by Pacific Great Eastern Railway—is still both primitive and untamed. Station builders, for example, rooted more than a few bears from hibernation.

The station (like its downstream sisters) is linked to Vancouver and Taylor, B. C., by microwave radio (three separate channels: dispatch, operations, supervisory).

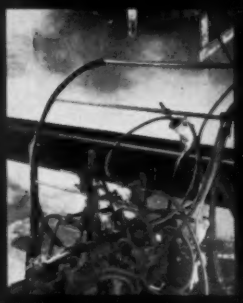
Gas flow: Typically, Station No. 3 taps the Westcoast line with a 30-in. line which, via two 20-in. scrubber-laterals, feed two dry-type Aerotec scrubbers (each rated 230 MMcf/day, 600 psig).

Out of the scrubbers, gas routes via the station's main suction header (30-in.) to the compressors' 24-in. suction line. En route the 30-incher is tapped by a 4-in. fuel gas line (which supplies not only the Nordbergs but the station's three dual-fueled electrical generators). Recompressed to about 865 psig, gas returns to the downstream side of the pipeline via the station's 30-in. discharge header.

Gas-flow through the DeLavals is "straight-through" at Stations 5 and 7. The compressors operate in series. Gas can be by-passed via a 24-in. line installed with 20-in. Chapman tilting disk gate valves (these in the station's basement). At Station 3, loop piping is used.

Electrical self-sufficiency — Two Ingersoll-Rand PSVG-10 natural gas engines, driving Canadian General Electric generators supply 500 kw, 480-volts, 3-phase, 60-cycle power. Back-stopping them is a 50-kw (460-volt, 60-cycle, 3-phase) Onan gas engine-driven generator set (with a bore of 4⅜ in., a stroke of 5 in.).

Generator engines exhaust through Kittell silencers, take their air through American Cycoil oil-bath filters. However, unlike the winterized Nordbergs, generator-



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ABOVE: 16-inch pipe being spray-coated for use in new Transcontinental Gas Pipe Line Corp. gas-gathering system near Tilden, Texas.

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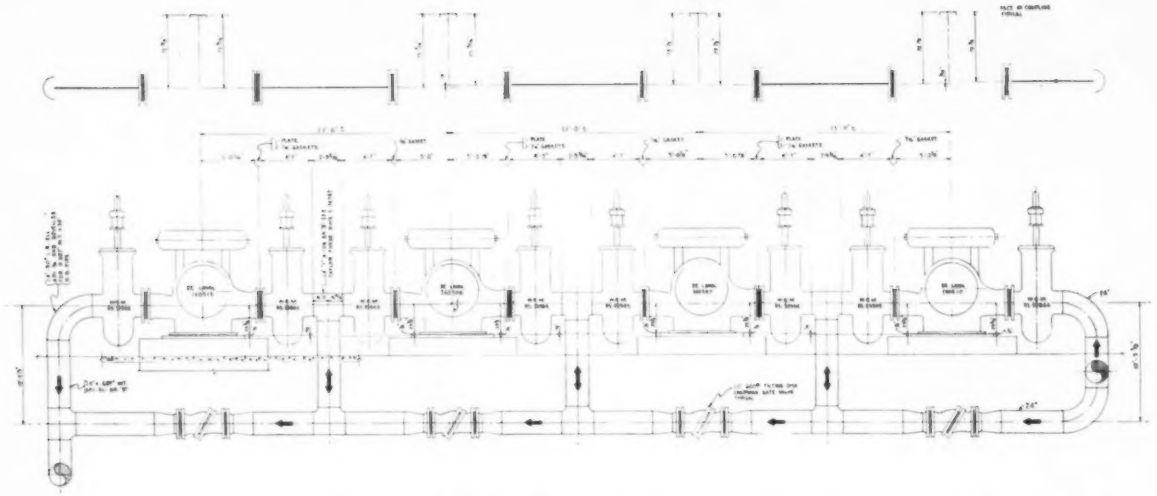
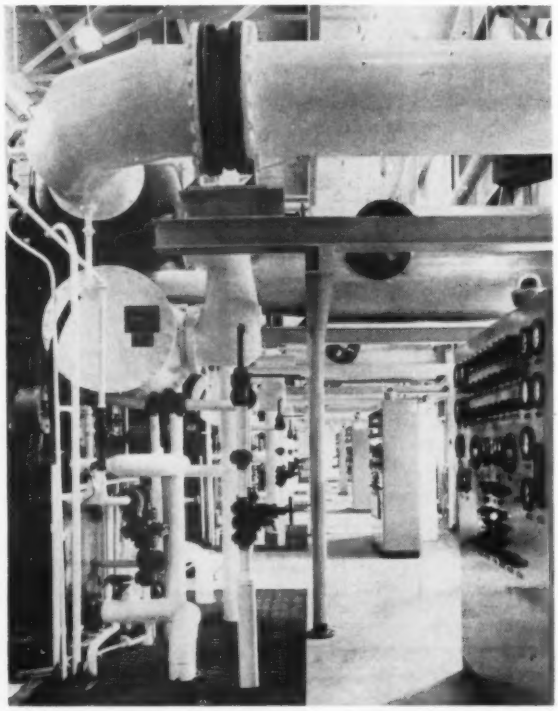


Main gas flow diagram for Station No. 3.

engine air isn't pre-warmed through exhaust silencers.

Winterization: Like Station No. 1, downstream compressor plants are winterized: (1) All tankage is either inside the building or buried below the 8-ft frost line; (2) under-roof drains catch snow runoff (snow depth at some stations reaches 5 ft), route it via in-plant piping to below-ground sewers; (3) cooling systems are protected by 50 per cent-50 per cent glycol-water mix; (4) piping is either buried a minimum 8 ft (if outside), or if inside, jacketed (aluminum covers, rockwool-packed).



Front end of four spark-ignition gas engines. Also shown: intercooler, turbocharger, and gauge board with semi-automatic controls.

Tankage: Station No. 3's tankage is indicative not only of its isolation—but of its self-sufficiency. There's propane storage for 8000 gal., a 400-gal. vessel for potable water (located in the station's heated garage-pump house), 500 gal. of anti-freeze (in the hot-water heated compressor building), and (1) 18,000 gal. of reinforced underground storage for fire water, (2) similar underground storage for 6000 gal. of potable water.

Thus, Compressor Station No. 3 must gird itself against fire, worry about engine freeze-up and both pump and store its own water, cooling and potable.

Moreover, since lube oil must be hauled the 94 miles from Prince George, reconditioning—even more so than at Station No. 1—is an operational must.

Housed in Station No. 3's basement auxiliary section are (1) tankage for 2000 gal. of clean lube-oil; (2) a 1200-gal. used lube oil settling tank; (3) a 3000-gal. lube oil transfer tank and (4) other vessels holding from 400 to 700 gal. of accessory lube oil. Lube oil is reconditioned through a Hoffman-Allan 250-350 gph vacuum evaporator filter, rigged with electric heaters.

Lube oil systems: The engine-driven centrifugal units are served by two separate lubricating set-ups, one lubricating the main engine, and the other—called the "accessory lube oil system"—serving the compressors and speed-increasers (and their associated gear). Full-flow (Winslow) and knife-edge (Purolator) type filters serve both systems. In addition, the main lube oil circuit is installed with a by-pass filter (Winslow).

Typically, main engine full-flows are rated 400 gpm, the knife-edge, 450 gpm, and the by-pass, 60 gpm.

Engine Cooling: Jacket water systems are the closed, blended, circulating type, the main engines consisting of forced draft finned-tube horizontal radiators (Trane), capable of cooling 288 gpm of jacket water

from 170° to 110°. A 50 per cent glycol solution serves as coolant system anti-freeze, making it unnecessary to drain the systems each time an engine's shutdown.

The stations' main generators (two of them) are served by vertical forced-draft coil-type radiators (Trane), with automatic shutters. Like main engine radiators, they're located outside the station.

Pre-warmed intake air: Unique are the stations' systems for pre-warming intake engine air—this because of outside ambient temperatures which may fall to —50°.

Main engine air, entering through vertical Cycoil (oil bath) filters, routes through chambers jacketed around their associated Kittell silencers. Warmed by the engine's own exhaust, intake air flows to superchargers.

Engines set on rails: Equally novel are the 14-in. I-beams on which both engines and their speed-increasers are mounted. Rails, imbedded in engine foundations, aim to allow for the engines' inherent thermal expansion.

Fuel gas: Tapped from the suction header, fuel gas is delivered to engines at 50 psig. Gas flows through a Winslow 75-psig fuel gas filter, shutdown control valve, pressure regulator, flow indicator and fuel gas heater (Griscolm-Russell thermostatically controlled to maintain 100°F) before going to the engines.

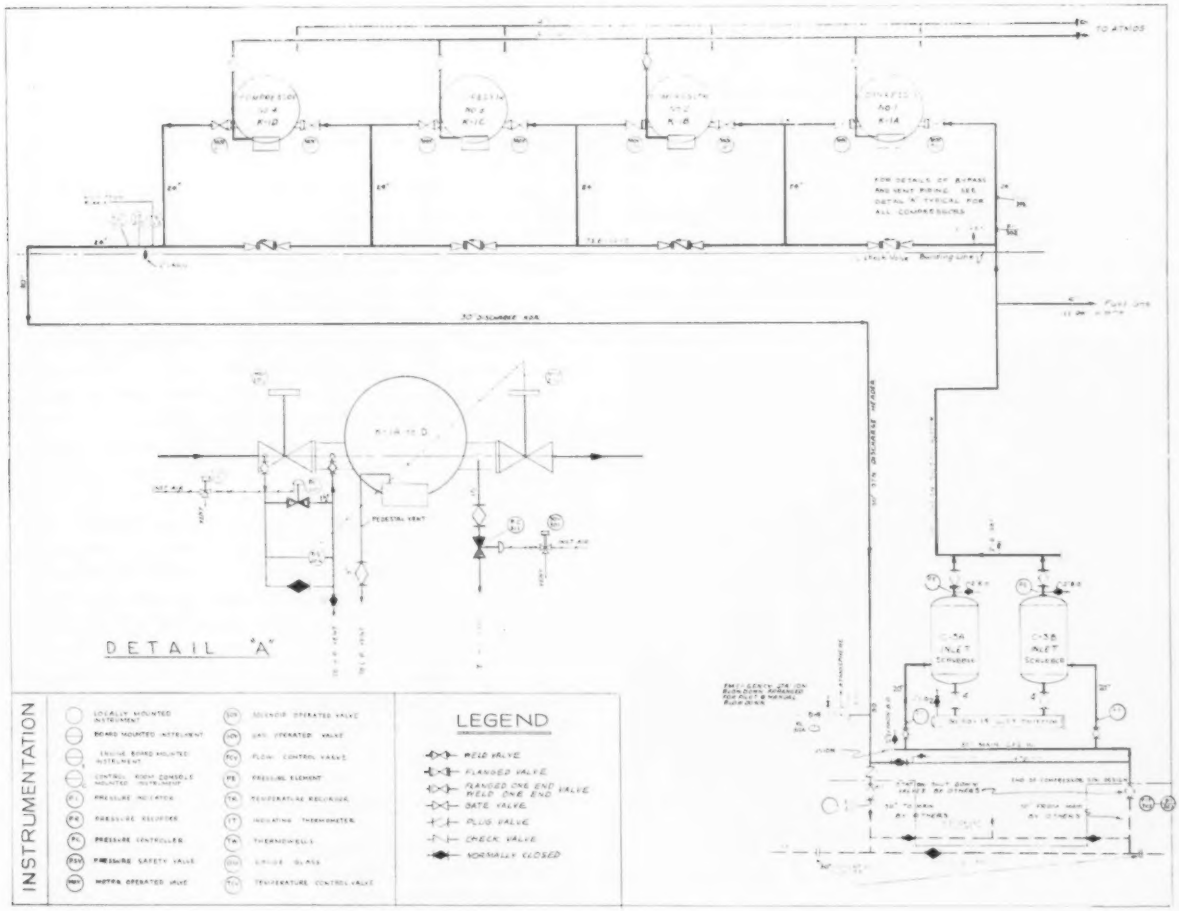
Compressed air: As at Station No. 1, two starting-air compressors, one standby, furnish air for the Nordbergs. The main starting air compressor (an Ingersoll-Rand 2-stage V-belt driven, 100-cfm free air at 250 psig compressor) is powered by a 50-hp motor. An identical standby compressor is gas-engine driven.

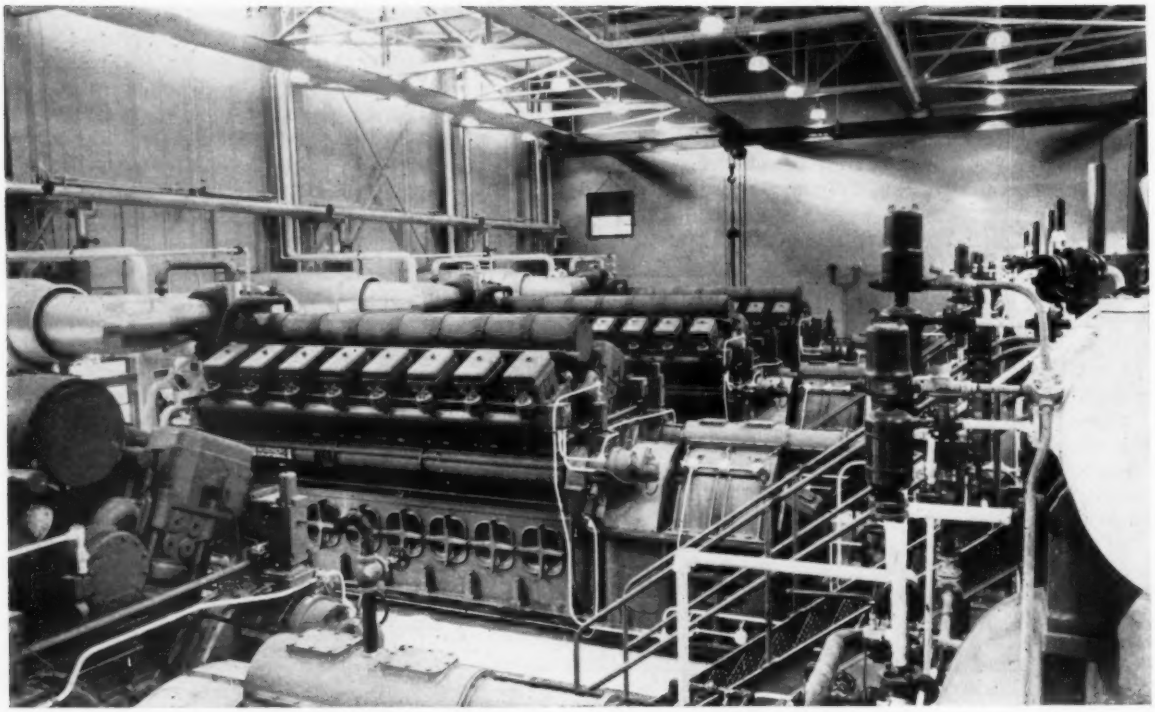
Semi-automatic start-up: Engine controls are designed "semi-automatic" with the whole start-up procedure controlled from the Nordberg engines' gauge boards (each engine has its own). When the operator pushes a pre-start button, controls carry the unit to a "pre-start" condition with no further action required.

Prior to pushing the button, however, the operator must: (1) check auxiliary equipment; (2) set selector switches at various pumps to "automatic" positions. Involved are lube oil pumps, crankcase vacuum pumps, air filter pumps, accessory lube oil, seal oil and auxiliary seal oil pumps; (3) check selector switched on the unit discharge and suction valves.

Preliminary checks completed, operator pushes the pre-start button (on unit boards or station's main console in auxiliary wing's control room). Crankcase

Major gas piping assembly procedure for Westcoast's Station No. 5.



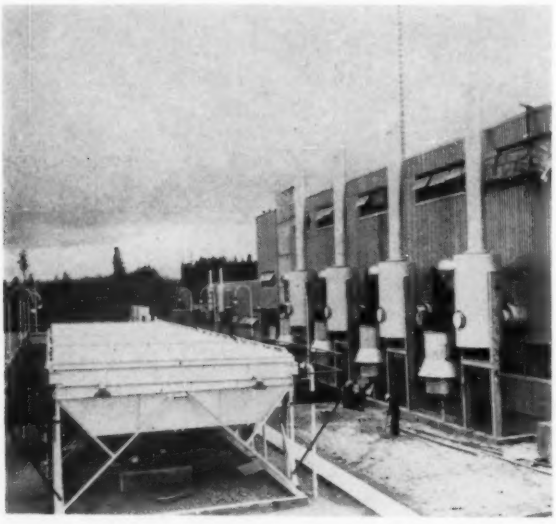


Interior view of Station No. 5, showing the four gas engines.

vacuum pump, air filter pump and main lube oil pumps start simultaneously.

Start-up sequence: The accessory lube oil pump starts when oil temperature at its discharge reaches 90°F (the accessory lube oil tank is warmed by hot-water heating coils). When oil from the accessory lube oil pump reaches 20 psig, the main and auxiliary seal oil pumps start.

When a "high" level switch in the seal oil tank closes (indicating that the tank is full), the unit by-pass pressuring valve opens to pressurize the compressor case. After a 30-second time delay, the unit vent-valve closes.



Rear of Station No. 5, showing radiators, air filter intakes and exhaust silencers.

Ignition doesn't come on until the engine is purged, the gas turned on.

Entire pre-start sequence is interlocked. When sequential steps are completed, a blue "on" light comes on (light's located both on the engine's unit board and on the station's console panel).

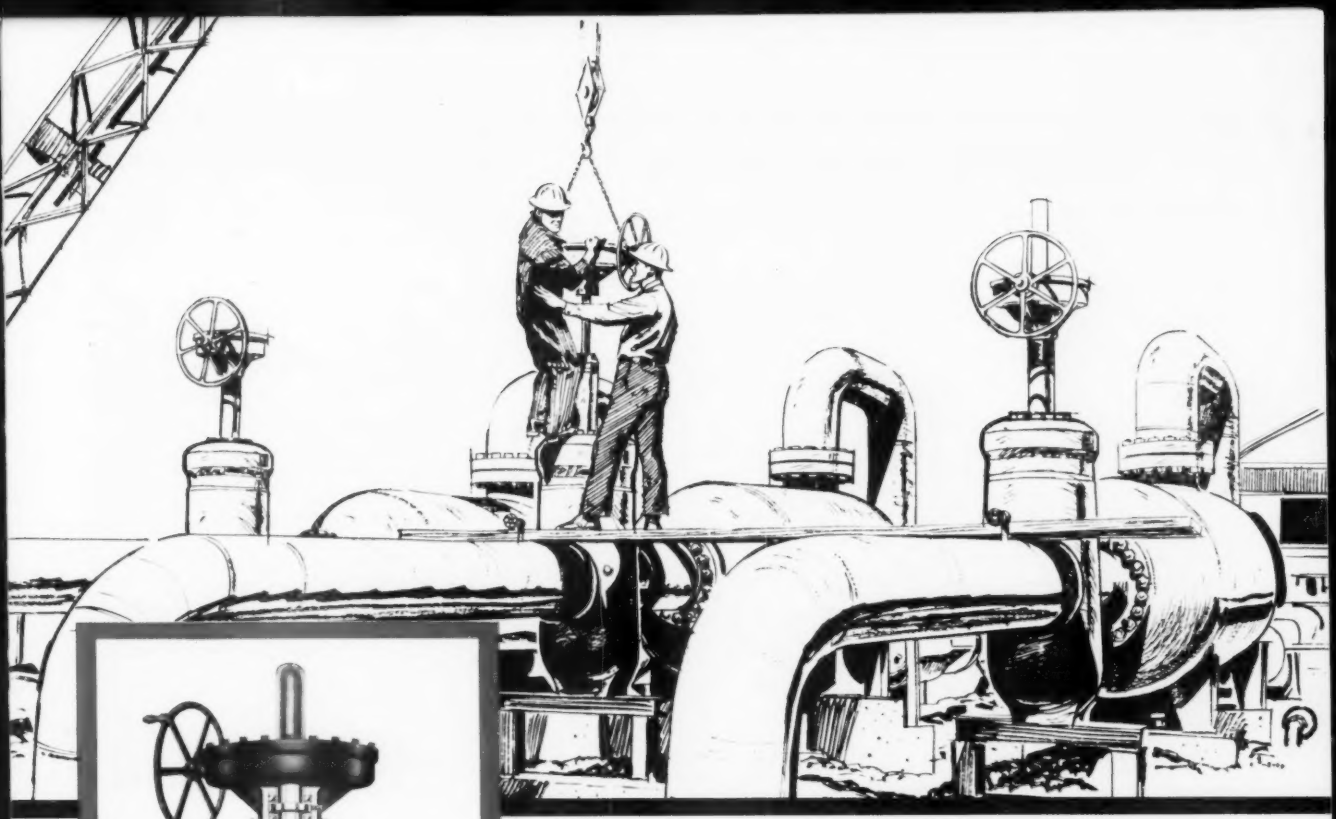
Pre-start sequence requires about six minutes (this, if accessory lube oil is pre-heated prior to start-up).

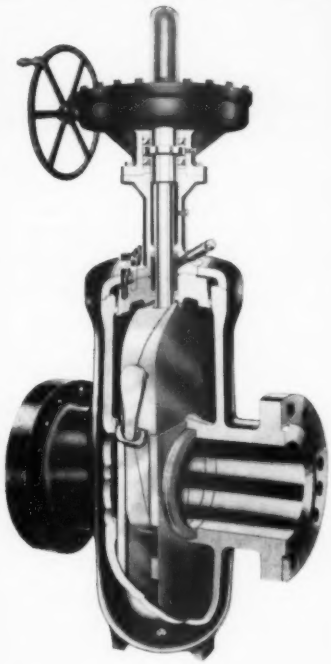
Each engine's annunciator panel monitors 14 separate shutdown and 9 separate alarm signals.

If a shutdown intelligence device becomes operative, signalling a system fault, a red light atop the engine board flicks on. Simultaneously, a red shutdown light blinks "on" (on the engine panel), pin pointing the trouble. At the same time the unit light on the main console goes out . . . and a continuous howler signal sounds through the compressor room and auxiliary wing. A buzzer gives warning in the main control room (also in the auxiliary wing).

Says a compressor station specialist, "Downstream—as up—every station's winterized, its pipes buried 8 ft, every foot of its steel certified to meet a 15 ft-lb Charpy test at —50°F. And along those 650 miles, temperatures in the low 40s and 50s—*below* zero, that is—are par during the course of most winters." ■

Author Joseph will discuss Westcoast's maintenance program in the third and final part of this series in the September issue of GAS.





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GAS • PIPELINE NEWS

FPC launches new study into El Paso's reserves

The FPC is reopening the proceedings covering El Paso Natural Gas Co.'s plan (Docket G-12580) to make gas available to Southern California Edison Co.

In its order, the FPC said that "We believe that it is in the public interest . . . that in every case in which it seeks to sell additional substantial volumes of natural gas, El Paso make a complete and current showing of all its gas reserves and its gas deliverabilities, distinguishing between certificated sources and uncertificated sources, and also of the volumes of gas needed to meet its market requirements and for other purposes . . ."

The G-12580 application had been consolidated with G-11797, in which El Paso sought to construct facilities to increase service to California and Arizona customers. The commission issued a certificate covering G-11797 but remanded G-12580 to the presiding examiner for decision. His assignment was to determine the extent to which El Paso has succeeded in meeting requirements imposed by the FPC in Docket G-10499 (issued in December 1956). At that time the FPC called on El Paso to present a definite program showing how its future system needs are to be met.

Seaborn Digby leaves Federal Power Commission

Commissioner Seaborn L. Digby, a member of the Federal Power Commission since August 1953, resigned from the commission last month upon the expiration of his present term.

Commissioner Digby was nominated to the FPC by President Eisenhower on July 28, 1953. His nomination was unanimously confirmed by the Senate on July 31 of the same year. He twice served as vice chairman of the FPC—in 1955 and 1956.

Before going to Washington, Commissioner Digby served as Louisiana's commissioner of conservation from 1948-1952. For 10 years before that he served as Monroe (La.) city attorney. Mr. Digby is returning to Monroe where he will practice law.

John B. Hussey, now serving as Louisiana's conservation commissioner, was nominated by President Eisenhower to succeed Commissioner Digby. Mr. Hussey is a 51-year-old attorney from Shreveport.

Columbia moves to acquire Gulf Interstate system

Columbia Gas System Inc. plans to acquire substantially all the assets of Gulf Interstate Gas Co., owner and operator of an 860-mile pipeline running from Louisiana to West Virginia.

The transaction is subject to approval by Gulf Interstate's stockholders as well as certain government agencies. The holders of each share of Gulf Interstate common stock will receive 0.79375 shares of Columbia's common stock. Gulf Interstate Gas Co. will be dissolved when the transaction is concluded, which is expected to be prior to Dec. 31, 1958.

In addition to the 860-mile 30-in. main transmission line, Gulf Interstate also owns 350 miles of lateral and gathering lines in Louisiana and ten 14,000-hp compressor stations.

Gulf Interstate Co., a wholly owned subsidiary of Gulf Interstate Gas, will not be acquired by Columbia but will be sold or otherwise distributed to the stockholders of Gulf Interstate.

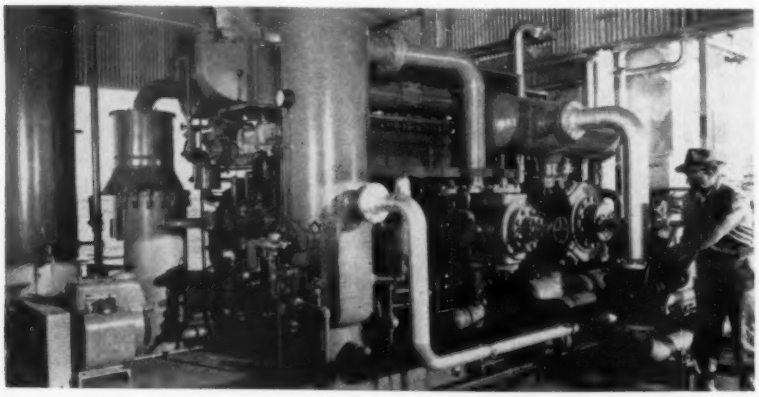
Owner of some miscellaneous oil and gas properties, the subsidiary primarily is engaged on consulting, engineering and designing in natural gas and related fields. The Transwestern Pipe Line Co.'s proposed line from west Texas to California will be engineered and designed by Gulf Interstate. It also has been retained to render engineering services to Columbia and its subsidiaries.

Inequities in spectrum conservation pin-pointed

Severe inequities exist in the matter of national radio spectrum conservation, according to a General Electric communications executive. He declared that if land mobile radio services are to "suffer the costs, trials and tribulations of further sharing and squeezing," they are justified in requesting a "fair share of the spectrum."

The speaker was Richard P. Gifford, manager of engineering for the General Electric communications products department in Syracuse, N. Y. He addressed the AGA's distribution, production and transmission conference in New York recently.

He pointed out that the same general opinions were expressed by the mobile radio industry,



Permian Basin Pipeline Co. recently installed this Worthington SLHC-4 cylinder turbocharged engine compressor at its Jal, N.M., compressor station for gathering low pressure gas in the Permian basin. The skid-mounted unit is one of two engines fabricated by Foor Engineering Co. This engine is equipped with engine- and gas-cooling equipment, gas scrubbers and safety controls. The 450-rpm unit is rated at 317 bhp at 3700 ft.

Along the new highways . . .
ROSKOTE DOES THE JOB WITH SPEED!

Fast drying that permits overcoating or wrapping in a half hour steps up the protective coating phase of new pipeline construction on the jobs where speed is essential — along the nation's new network of highways.

A good example is this 8000 foot stretch of new 8" pipe along the new Southside Expressway in downtown Charleston, W. Va. It was installed recently for the United Fuel Gas Company by Saul and McCallister, Inc., of Yawkey, W. Va.

This contractor found that two men, using the Roskoter for application of Roskote 612 XM cold-applied pipe mastic, could keep pace nicely with the welders. The coating specifications called for over-the-ditch cleaning, two 15 mil applications of Roskote 30 minutes apart, followed immediately by wrapping with 15 lb. perforated asbestos pipeline felt.

Roskote 612XM is a cold-applied, fast-drying pipe mastic of high electrical resistivity. Composed of high grade native pyrobitumens homogenized with quality aromatic solvents and inhibitive pigments, Roskote is also highly resistant to corrosion by acid, alkali and salt. It dries to a tack-free film in 30 minutes or less. It is unaffected by temperature from sub-zero to 250°F. It will not oxidize, scale or check, and it bonds readily to previous coats of Roskote, coal tar or asphalt.

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A LEADER IN THE FIELD OF INDUSTRIAL COATINGS FOR CORROSION CONTROL.

through the land mobile section of the Electronic Industries Association in its filing last fall on Docket 11997, dealing with frequency allocation from 25 to 890 mc.

Mr. Gifford said the land mobile radio services have taken the lead nationally in spectrum conservation. He illustrated this point by showing that, through combined efforts of existing licensees, manufacturers and the Federal Communications Commission, there has been new channel-splitting which will enable a large number of new licensees to enjoy two-way radio's advantages.

"No other user of the spectrum can come close to this public service record of spectrum stewardship," he said. Mr. Gifford contends that other occupants of the spectrum have yet to take even their first steps in spectrum conservation, while the mobile services are now talking of a third step—single sideband.

Discussing the use of single sideband in mobile radio application, Mr. Gifford pointed out that while engineering work has been going on in the industry in the direction of SSB, there has been a flood of innovations in FM and AM techniques. He said that, as new uses of devices such as transistors are developed, these uses first find their way into the simpler radio applications—like FM and AM—and that it is likely that there will be completely transistorized FM and AM equipment "long before SSB."

He contended that single sideband does not appear to save spectrum space over plus or minus 2.5 kc FM; that SSB is considerably inferior in the presence of "spike" noise unless a blanking scheme is used; and that, while SSB can provide longer range, it does so only with poor readability. SSB equipment also would be almost twice the size of comparable FM equipment, he said.

Mr. Gifford reported that studies of single sideband by equipment manufacturers have led to a better understanding of the real capabilities of FM and have stimulated further improvements in FM equipment with no loss in performance.

"Our complacency that FM has gone as far as it could has been shattered," he said.

Meeting in Columbus, Ohio recently was this group from the committee on pipeline underground crossings of railroads and highways of the American Society of Civil Engineers. Seated (from left): D. A. Roach, Phillips Petroleum; E. F. Trunk, Laclede Gas; Committee Chairman J. E. Thompson, Natural Gas Pipeline Co. of America; E. A. Slade, Okam Pipeline Co.; and George D. Mock, Washington Gas Light. Back row, from left: Lowell L. Elder, Columbia Gas System Service Corp.; William B. Hass, Northern Natural; James C. Fisher, Consolidated Edison of New York; and T. J. Wootan, Southern California Gas.

Underground crossing committee meets

The committee on pipeline underground crossings of railroads and highways of the American Society of Civil Engineers met in Columbus, Ohio recently.

The three-day meeting was a concerted effort to actually write as much of a first draft of the crossing specifications as possible, based upon the "Tentative Outline of Code on Specifications for Pipeline Crossings of Railroads and Highways," approved at an earlier meeting.

Task groups participating include advisory; loads, stresses, and design equations; alignment and location; material; and liaison. Each task group will revise its material in accordance with the Columbus discussions and then give the revised material further consideration.

The committee agreed that the quoted timetables for the development of the completed crossing specifications were optimistic, judging from the amount of work yet to be completed. It was also agreed that until reasonable agreement has been reached by the committee, its findings will not be submitted to the organizations and agencies represented.

Intermediate decision must be rendered

FPC denied motions to omit intermediate decision procedures and to sever certain portions of the consolidated proceedings involving Transcontinental Gas Pipe Line Corp.'s major construction plan covered in Dockets G-13143, et al.

The several applications involved in this case cover new facilities Transco would build to provide additional service as well as transportation service for Consolidated Edison Co. of New York. Also, the plan of Transco, New York State Natural Gas Corp., and Texas Eastern Transmission Corp. to develop jointly storage pools in Pennsylvania.

Contract authorized with escalation clause

An FPC presiding examiner has refused to condition a certificate to eliminate escalation clauses.

This case, covered in Dockets G-8289 and G-7029, involves authorization of sales by Buffalo Oil Co., Tulsa, to Transcontinental Gas Pipe Line Corp. from the South Duson field in Lafayette parish, La. The condition was requested by the FPC staff and a group of intervenors, including the New York PSC and several of Transco's utility customers.

The intervenors objected to a price redetermination clause in the contract. The initial price is to be redetermined at stated intervals on the basis of the three highest prices paid in the pricing area. They also sought to have eliminated a two-party favored-nations clause. They did not object to the initial 16-cent rate.

Presiding Examiner Daniel J.

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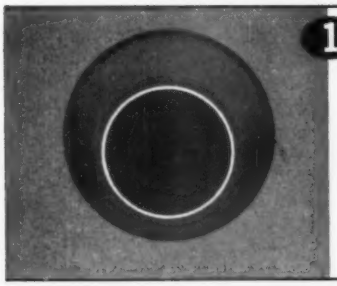
NON-SKID TEETH AND EXTRA LONG GRIPPING AREA ANCHORS BUSHING SECURELY

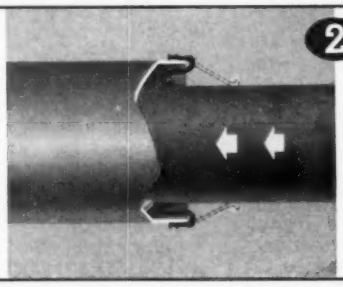
PUNCTURE PROOF
EXTRA THICK SHOULDER (BUNA-S SYNTHETIC RUBBER) PREVENTS CASING EDGE FROM CUTTING THROUGH BUSHING

NO SHIELD REQUIRED
THICKER FLEXIBLE "LIP" ELIMINATES NEED FOR SHIELD. WITHSTANDS WEIGHT OF BACK-FILL EARTH

A TIGHT SEAL UNDER ADVERSE CONDITIONS



1 WHEN PIPE IS OFF CENTER . . .



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pipeline news • *Cont'd.*

Kelley said that any increase in the initial rate may be made effective only by filing a change in rate with the FPC. He declared that the public convenience and necessity simply do not require that an independent producer's contractual right to receive a higher rate in the future be taken away by the commission merely because of the type of provision made in the contract for arriving at the amount of the increase.

Florida ruling stands

The U. S. Supreme Court refused to review the FPC's approval of the Houston-Coastal plan to bring natural gas to Florida. The Florida Economic Advisory Council (fuel oil dealers, truck lines, marine transportation companies and allied businesses) has been throwing up legal blockades since the FPC certificated the plan last December.

TGT buying New York firm

Tennessee Gas Transmission Co., Houston, plans to buy Middle States Petroleum Co., New York.

According to TGT, the transaction, already approved by Middle States directors, provides for Tennessee Gas to offer 45 shares of common stock for each 100 shares of Middle States common. This would amount to about $30 million.

Ohio line proposed

Ohio Fuel Gas Co., Columbus, wants to spend some $2.1 million on 51 miles of line along its transmission system in Ohio (Docket G-14766). The new facilities—slated for Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties—would loop or replace sections of existing lines which, because of size or condition, will not be capable of providing adequate market service next winter.

Am-La seeks new reserves

American Louisiana Pipe Line Co. wants to attach a 90-billion cu ft reserve to its supply system (Docket G-15053).

A 28-mile, 12-in. purchase lateral would take gas out of Big Lake field in Cameron parish, La. Estimated cost: $1.5 million. Pan American Petroleum Corp. would sell the gas at 18.25 cents/Mcf with a 2.5 cent escalation clause every five years.

GAS • Pipeline Notes

Texas Eastern Transmission Corp., Shreveport, is building an underground storage cavern for LPG at Lebanon, Ohio. LPG will be transported to the Todhunter terminal from Gulf Coast origins through the Little Big Inch. From Todhunter, it will be dispersed by truck and rail transport to states from Michigan to New England. The initial cavern will hold more than 12 million gal. of LPG.

Trunkline Gas Co., Houston, has a certificate (Docket G-14704) for its two 24-in. lines across the Red river in Louisiana. The $1.7 million crossings are 5240 ft long.

Pacific Northwest Pipeline Corp. has moved into its new headquarters building at 315 East Second South Street in Salt Lake City. Mail address is P. O. Box 1526.

United Fuel Gas Co., Charlestown, W. Va., proposes to activate an additional underground storage pool in Big Sandy district of Kanawha county, W. Va. Also covered in Docket G-12295 is a 16-in. line from the company's Coca compressor station to the storage area, together with storage field line and measuring facilities. Columbia Gas System Inc. will finance the $1.5 million job.

Algonquin Gas Transmission Co., Boston, has filed Docket G-14876 for a 4000-hp compressor station at Cromwell, Conn. The $1.7 station would provide an increased margin of safety between Algonquin's system requirements and system capacity.

New York State Natural Gas Corp., Pittsburgh, has temporary authority from the FPC (Docket G-14957) to construct and operate 13 miles of 20-in. line in Potter county, Pa.

Montana-Dakota Utilities Co. plans to loop its Laurel-Billings line with 11.9 miles of 12-¾-in. pipe (Docket G-15054). The company also plans to replace its Billings town border station.

Lone Star Gas Co.'s budget-type construction proposed in Docket G-14136 has been approved by the FPC. Approximately $1.7 million will be spent on various lateral pipelines compressor stations, and treating plants.

GAS Pipeline People

John F. Lynch
Texas Eastern

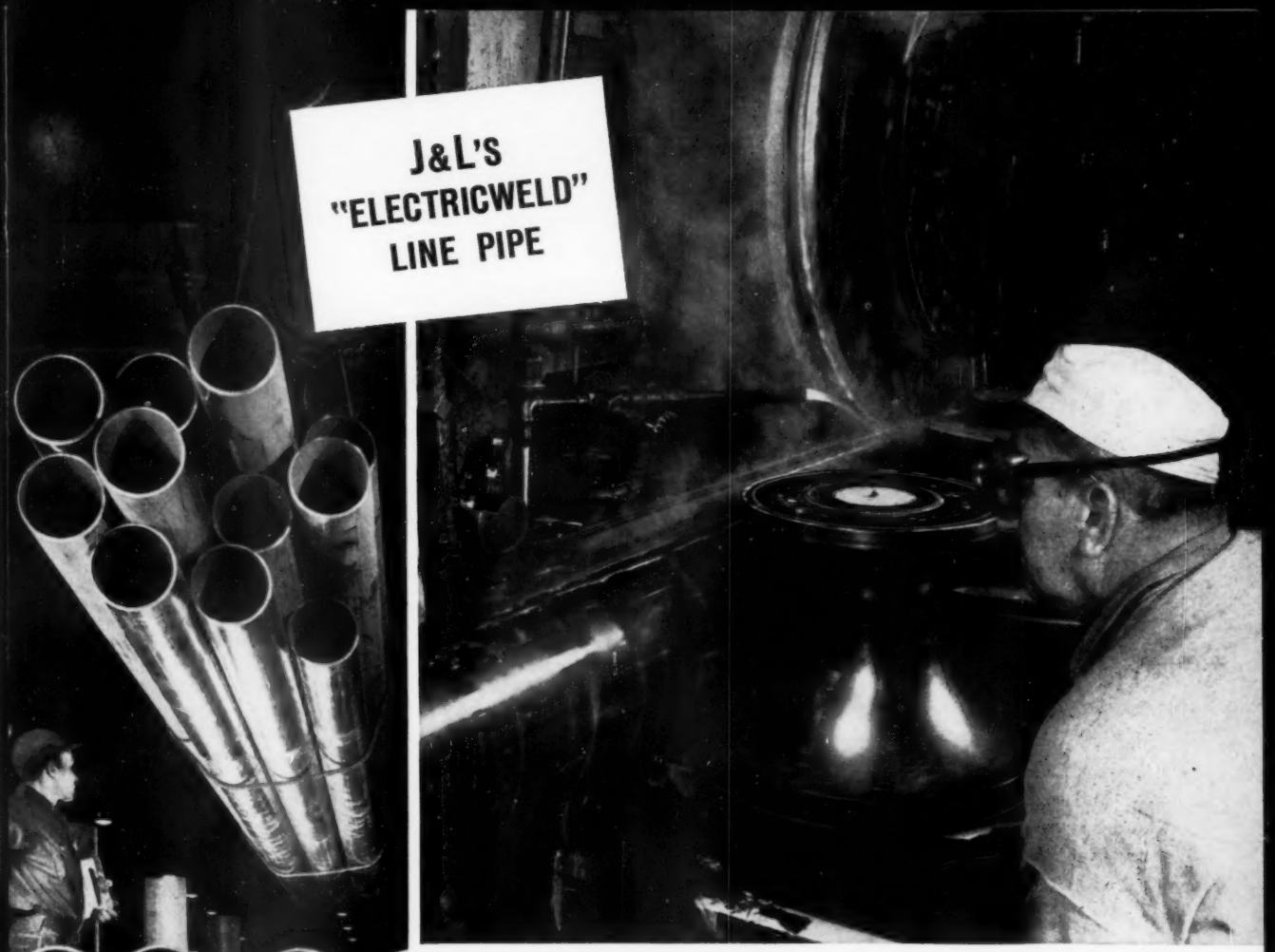
Baxter Goodrich
Texas Eastern

A major expansion in the top echelon of Texas Eastern Transmission Corp.'s management has been announced. Named were three senior vice presidents, each in charge of an operating division of the Shreveport-based company; a new administrative vice president; and a financial vice president. The senior vice presidents are JOHN F. LYNCH, also president of LaGloria Oil & Gas Co., who will be responsible for exploration, production, refining and processing operations; BAXTER D. GOODRICH, formerly vice president and chief engineer, who is now responsible for all company transmission activities as well as for operation of its 6000-mile pipeline; and MILLARD K. NEPTUNE, who is in charge of the company's Little Big Inch division. As administrative vice president, PAUL R. HAAS has overall charge of administrative functions, with particular reference to diversification. He also will be responsible for accounting and personnel operations. J. W. HARGROVE, the new financial vice president, will continue to direct financial activities of Texas Eastern, including stockholder and public relations programs. He has been vice president and secretary of the company. Taking over the post of vice president and chief

Continued on page 118

Millard Neptune
Texas Eastern

Paul Haas
Texas Eastern



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Teletax receivers include: Single or Dual Receivers; Multi-Record Receivers for recording up to 6 separate measurements on one chart; and Teletax Receiver-Controllers for automatic operation. And the Teletax signal can be simply converted to digital information.

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TELETAX TELEMETERING

Edited by FRANK CHAPMAN

Considerations for the prospective microwave user

By F. VINTON LONG

THERE are two distinct types of non-military microwave systems in use today. First we have the long haul low density ribbon type such as installed on our pipelines. At the other extreme we have the long and short haul high density facilities used by the common carriers.

The economics of these dissimilar services vary sharply, as does the equipment involved.

The ribbon type users of low density equipment many times find difficulty proving in an economic advantage of a privately owned microwave installation, although operational advantages and reliability of a *good* microwave system may justify a considerable procurement expense.

Unfortunately, in the past, it has been the tendency to reduce the initial cost of such systems in order to compete with leased wire facilities. As a result some users have wound up with facilities which may be cheaper than leased wire but do not give the reliability.

This is unfortunate, and reflects against the true value of good microwave systems.

A minimum ribbon system will cost about $1,500 a mile in favorable terrain and a heavy-duty system about $2,500.

If you demand the highest degree of reliability, then you had better prove in the heavy-duty type, or else forget the whole thing.

The common carriers have high density requirements and can easily justify the cost of heavy-duty battery operated 100 per cent dual equipment facilities.

Private industry and the utilities can easily justify this initial cost if sufficient loading is available. Maintenance is cheap and is no problem with good microwave facilities. It is a major problem with the cheaper systems.

An exception to all the above is the single channel short haul battery operated transistorized "Black Box" telecontrol link. There is a need for this machine in the industrial services but so far no supplier feels justified in creating this "Volkswagen" of the microwave field.

I am not trying to scare off prospective users of privately-owned facilities, and if they really need it there is no reason why it can't be a successful operation. However, a lot of investigation and design work is certainly indicated before jumping into this field.

Assuming that we have sufficient load requirements to pay out the installation — and this will vary from four to 10 voice type channels—then we should look at these pitfalls.

Unattended relay stations are the greatest single source of trouble in a microwave system and are also the most expensive item, and within the relay station the greatest source of grief is the power supply. Older minimum type systems employ a standby ac generator set and the whole station runs on ac. This just will not get the job done if fail safe operation is required and in that case dc and battery operation is indicated, with a dc generator set to charge the battery during long commercial power outages.

Tower lighting is another pain for remote relay stations and if at all possible it is best to keep the heights down to 160 ft and not light them. This takes a load off your emergency power supply and eliminates lamp failure alarms and other gadgets. The higher towers, if any, can be at the terminal locations.

The access road is a most important problem, and the path routes should really be chosen with the goal of having each relay station located on an existing highway. If you are not careful an access road can cost more than the entire station and they have a bad habit of washing away during bad weather.

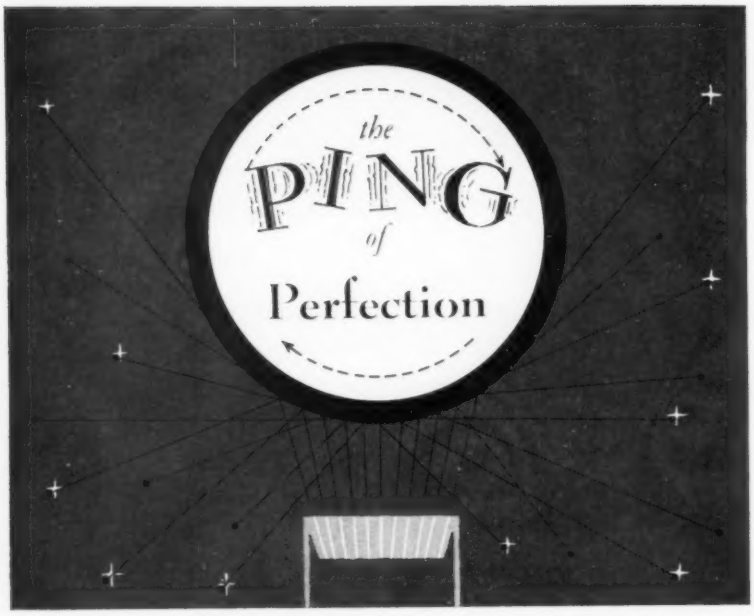
Housing is important. The best house is none at all, with the equipment in weatherproof boxes strapped to the towers, but if this won't work make the shelter a good one and above all use forced ventilation or air conditioning.

Keep the standby generator outside, or at least use the type that will vent its heat outside through an internal fan arrangement.

If you can't stand outages you must pay the price of dual transmitters and receivers and this is one of your better investments.

Wherever possible use four-wire operation and do not bring it down to two-wire terminations unless switchboard or connecting facilities require this. Tele-control equipment usually can be used on a four-wire operation and thus pro-

This article was presented at the ICA meeting, San Francisco, Calif., May 22, 1958.



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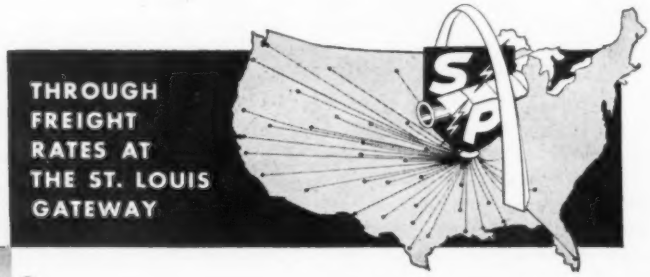

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vide a desirable full duplex operation.

Maintenance problems on a good system are minor, and the only real problem is transportation to a remote site. A man can make a trip once a month to a well-designed station and easily maintain it.

The terminals are usually no problem and mainly consist of channeling or carrier equipment. They should be similar in maintenance to conventional telephone equipment.

I know that you will ask why there are so few heavy-duty installations for industrial customers. The reason is that too many systems have been bought on the basis of initial price alone to such an extent that the suppliers of the more expensive heavy-duty equipment have just about given up any thoughts of going after this market. It's a great temptation to save those initial dollars and trust that fate will somehow keep things going.

I would like to say that the common carriers have been most cooperative with us in the pipeline business and we frequently meet with their engineers to work out arrangements to use their switchboards and other facilities. For instance, we have a remotely controlled compressor station at Linden, N. J., designed to operate over either leased line or microwave and engineers from the supervisory control manufacturer, the telephone company, and our company jointly worked out tie line specifications satisfactorily for telecontrol. In another case we converted our microwave ringing equipment within a section so that it would be identical to that used by a common carrier on a leased long haul voice circuit. The phone company engineers gave us advice on this conversion with the result that the two types of systems work perfectly when tied together.

In conclusion, I say that it is no easy matter to go out and build a private microwave system, but it can be done, and I strongly urge that if you do, please keep in mind that only the best will be good enough. ■

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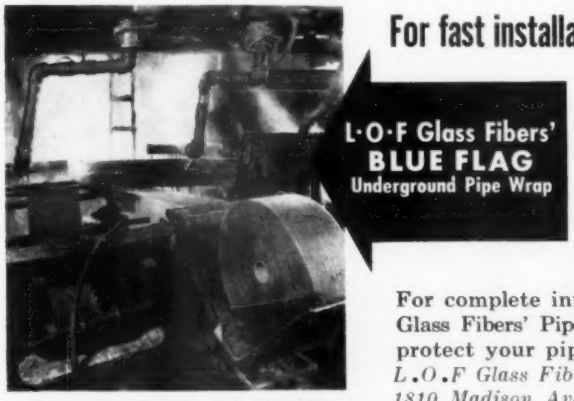
Application is fast and easy. Pliable *Duratape* conforms smoothly to irregular contours and provides an extremely tight bond because of its compatibility with primers customarily used in pipeline work.



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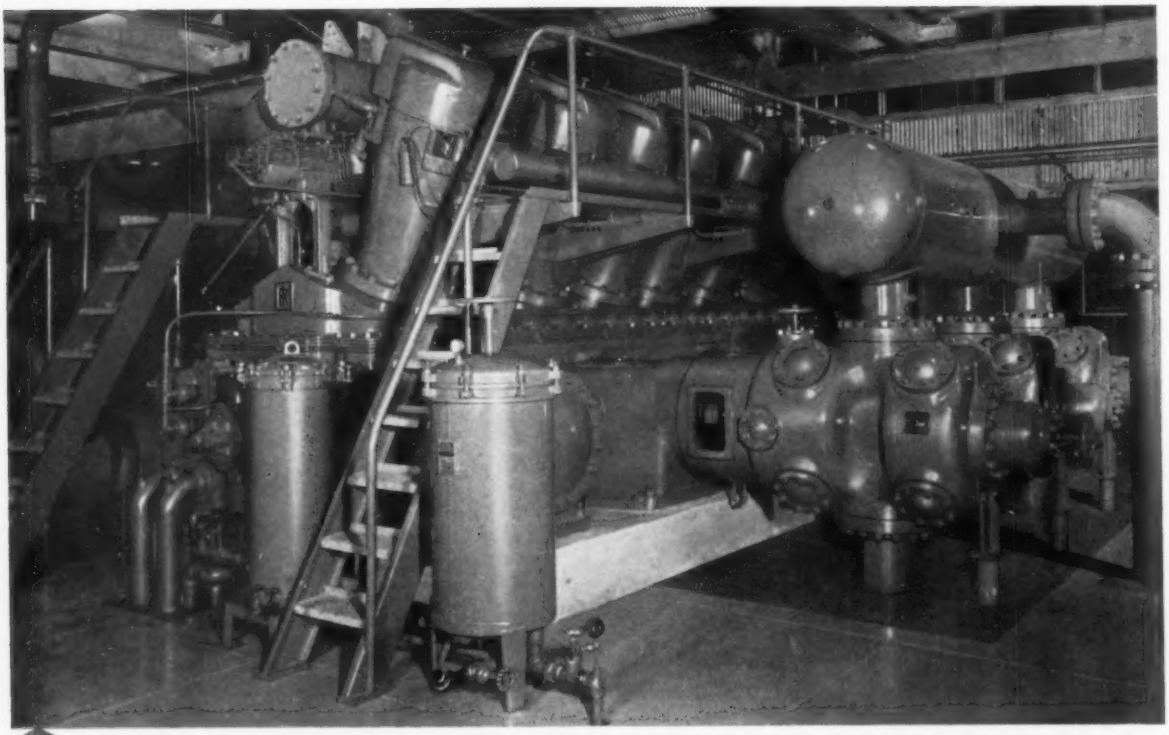
AUTOMATIC CONTROLS



This 1320-hp Ingersoll-Rand KVG gas-engine compressor is in operation at the Hooper Station of Northern Natural Gas Co. The unit is arranged for fully automatic operation as noted below.

CONTROL PHASES PROVIDED

Starting Control

After unloading the compressor end, the engine is started and brought up to a predetermined speed. When minimum engine temperatures are reached, stop valves are operated and the compressor is put on the line.

Normal Speed Control

By remote loading of the engine governor from the control panel, the operator may reset the speed of the engine to meet the demand for gas.

Warning Control

Any abnormal operating temperatures or pressures are reported at the control panel by a signal light and horn.

Emergency Control

Operating temperatures or pressures which reach emergency conditions are reported at the control panel by a light and horn. At the same time the engine is immediately shut down and all components of the system returned to starting position. Lube oil and cooling water circulate for 10 minutes more before being shut off.

Normal Shutdown Control

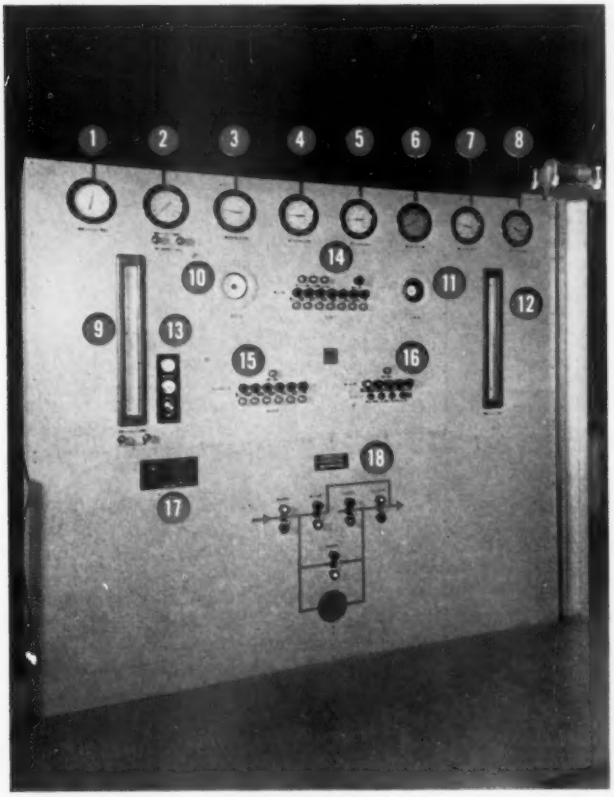
Through a series of timed events the engine is slowed down, taken off the line and brought to a stop. At this point all components of the system are returned to the starting position except the lube oil and cooling water systems, which circulate for ten minutes more.

Automatic control panel for I-R gas-engine compressor, designed by Viking Instruments, Inc., in cooperation with Ingersoll-Rand engineers. The panel includes the following instrumentation:

1. Starting Air Pressure
2. Lube Oil Pressure
3. Lube Oil Temperature—entering cooler
4. Lube Oil Temperature—leaving cooler
5. Oil Cooler Water Temperature
6. Jacket Water Pressure
7. Jacket Water Temperature—inlet
8. Jacket Water Temperature—outlet
9. Manifold Depression
10. Tachometer
11. Engine Hours
12. Fuel Gas Pressure
13. Instrument Air, Control Air, Speed Control
14. "Warning" Signals and Controls
15. "Emergency" Signals and Controls
16. "Start-Stop" Signals and Controls
17. Master Control—Power, Stop, Start, Off
18. Compressor Valve Indicators and Controls

make IR gas-engine compressor "THINK FOR ITSELF"

1320-hp KVG at Hooper Station of Northern Natural Gas Company features Fully-Automatic Sequence Control



A touch of a button activates the system which puts this big gas-engine compressor into action—another touch shuts it down. And all the time it's running, automatic instruments control the operation and protect it against damage from any cause.

This Ingersoll-Rand 4-cycle, V-angle KVG gas-engine compressor is arranged for completely automatic sequence control operation with a Viking instrument panel. The 1320-hp unit is installed at the Hooper (Nebraska) station of Northern Natural Gas Company.

This unit is not only automatic in operation, but is completely self-protecting. Continuous monitoring and alarm facilities permit immediate diagnosis of any trouble at an early stage, so *preventive* rather than *curative* measures can be taken—thus down-time and costly repairs are minimized. Should any operating conditions exceed safe limits, the machine is automatically shut down before any damage can be done.

On normal shutdown, the engine is slowed, taken off the line, idled for a minute at no load, and then brought to a stop. After either normal or emergency shutdown, lubricating oil and cooling water are circulated for ten minutes.

Ingersoll-Rand 4-cycle V-angle engine-compressors are ideal for automated and remote-control installations, due to inherently greater operating *stability* through a wide range of speeds and loads. Ingersoll-Rand has supplied millions of horsepower of heavy-duty compressors for every possible service, and builds many types of other equipment, in addition to compressors, for the pipeline industry. Call your I-R representative now for more information.

Similar automatic controls, with variations to suit service requirements, have been supplied on other sizes of Ingersoll-Rand gas-engine compressors. These include 440-hp SVG units and 2000-hp turbocharged KVS units.

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pipeline people • *Cont'd.*

from page 110

engineer—vacated by Mr. Goodrich—is ANDREW J. SHOUP. Mr. Shoup has been with the company since 1947, serving as assistant chief engineer. H. M. MCDONALD, for the past four years general manager of petroleum products pipeline operations, has been elected a vice president.

J. W. Hargrove
Texas Eastern

Andrew Shoup
Texas Eastern

D. L. Gallogly
Cooper

Frank Friedli
Cooper

D. L. GALLOGLY has been promoted to chief engineer of Cooper-Bessemer Corp., Mt. Vernon, Ohio, succeeding E. FREDERICK, who retired recently. Mr. Gallogly, with the company since 1929, will supervise the three engineering divisions of the company. FRANK L. FRIEDLI has been promoted to assistant sales manager, special projects. He will be responsible for sales of automatic controls to the gas, oil, chemical and power industries. Cooper-Bessemer's new branch manager for the east central district, headquartering in Mt. Vernon, is JAMES R. CRAINE. He joined the company three years ago as a sales engineer. Other assignments include WILLIAM BRAFFORD as field engineer in the Chicago district office, and DONALD T. KOCH as sales engineer in the east central district office.

G. E. STAHL, manager of gas supply for Pioneer Natural Gas Co., Amarillo, has been elected a vice president of Pioneer Gathering System Inc., a subsidiary of Pioneer Natural.

ROBERT L. WAGNER has been promoted to construction vice president of Somerville Construction, Ada, Mich. Mr. Wagner has been general superintendent since 1952.

DR. MAURICE H. BIGELOW has been appointed vice president of Barrett Division, Allied Chemical Corp., New York. Formerly technical director, Dr. Bigelow will continue to be head of the company's research and development department. Also announced is the appointment of STANLEY C. GERRARD to the post of assistant director of

James Craine
Cooper

G. E. Stahl
Pioneer

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Whether a spread is strung over flat farm lands or crowded into a congested city has little effect on SHEEHAN'S efficiency and speed of operation. With a versatile staff of qualified personnel and a wide selection of modern equipment, SHEEHAN can easily adjust to existing right-of-way conditions.

Whether your next line is laid *mile by mile* or *block by block*, it will be successful if it's built by SHEEHAN.

Let Sheehan's experience work for you on your next pipe line project.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

SHEEHAN

NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA

Main steam, boiler feed and miscellaneous piping for the nation's first full-scale commercial atomic power plant.

Dravo piping at Shippingport

Fabricating and installing piping for the Shippingport nuclear power plant presented many unusual problems. Specifications were extremely demanding and new techniques had to be employed.

In Dravo's Marietta shops, more than 3700 welds were made on stainless steel, aluminum, and carbon steel piping, ranging in size from 3″ to 12″ diameter. Many more thousands of welds were made at the site and all were thoroughly inspected and tested to assure performance under exacting conditions.

Each of the piping systems was hydrostatically tested at 1½ times the operating pressures. All of the butt welds and 99.9% of the more than 11,000 socket welds were leakproof on the first test.

Fabricating and installing this piping for the nation's first full-scale commercial atomic power plant demonstrates Dravo's ability to handle piping projects of all types. A letter will bring full information on pipe fabrication and erection facilities—write Dravo Corporation, Pittsburgh 22, Pa.

View of the Shippingport Atomic Power Station which was built as a joint venture by the U. S. Atomic Energy Commission and the Duquesne Light Company. Westinghouse Electric Corporation developed the nuclear components of Shippingport under a contract with the AEC. Duquesne Light Company is operating the station. As a sub-contractor to Westinghouse, Dravo fabricated and installed more than 10 miles of piping at Shippingport.

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CORPORATION

Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

pipeline people • *Cont'd.*

industrial relations. Mr. Gerrard has been with Allied Chemical since 1937.

JOHN V. JURASEK is manager of Worthington Corp.'s newly created process industries department.

JOHN M. THOMAS has resigned as vice president of H. C. Price Co., Bartlesville, Okla. He has been with the company since 1937. Mr. Thomas will remain as a member of the board of both H. C. Price Co. and H. C. Price of Canada Ltd., and will serve as pipeline consultant.

TOM P. WALKER has retired as chairman of Transcontinental Gas Pipe Line Corp., Houston. The office will not be filled. Mr. Walker will remain as a director of Transco. He became president of the company in 1953 and was elected chairman of the board last year.

P. A. GASS has been promoted to a senior vice president of Northern Natural Gas Co., Omaha. With the company for 27 years, Mr. Gass has been a vice president since 1952.

Tom P. Walker
Transco

P. A. Gass
Northern

RICHARD H. FOGARTY has been appointed pipe welding engineer by the Tube Turns Division of Chemetron Corp. Mr. Fogarty will be headquartered in New York.

DR. SALVATOR PICCIONE has joined the research and development department of Pittsburgh (Pa.) Coke & Chemical Co. New sales representative in the company's Industrial Chemicals division is DONALD L. MCCUEN.

JOHN A. SCHUCHART has been elected an assistant secretary of Northern Natural Gas Co., Omaha.

DONALD A. ROBERTSON, controller and assistant secretary of Panhandle Eastern Pipe Line Co., Kansas City, has been elected a national director of the Controllers Institute of America.

JOHN F. LYNCH, president of La Gloria Oil & Gas Co., was elected a director of Texas Eastern Transmission Corp. recently.

JOHN K. BEIDLER is vice president, commercial, of Dravo Corp., Pittsburgh. He will head up—at the corporate level—all sales, marketing, and new product activities. Mr. Beidler has been general manager of Dravo's machinery division since 1952 and a vice president since 1953.

BURT MENDELSON has been promoted to assistant director of marketing for the communications and industrial electronics division of Motorola Inc., Chicago.

RALPH L. LEADBETTER has retired as president of Burgess-Manning Co., Libertyville, Ill. He will continue to be associated with the company in a consulting capacity and as a director. S. G. PADDOCK, elected executive vice president a year ago,

From the gas-rich Peace River fields in Canada, an abundance of gas now flows to Southern British Columbia and the Northwest United States. Snaking its way over mountains, valleys and across streams it winds 650 miles to the Washington border.

Pumping gas over this tortuous route requires compressor stations,one of which is illustrated above. Here Aerotec Gas Scrubbers protect the compressors and metering stations by removing solid and liquid impurities. Each installation is capable of handling 530,000,000 SCFD at 600 psig and a pressure drop of 2 psi. They are a fraction of the size of other conventional scrubbers.

Aerotec Gas Scrubbers are serving practically every major gas line in the United States, South America and other parts of the world.

Contact our Project Engineers for further information on cleaning gas the DRY way.

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TUBE-TURN® LIGHT WEIGHT TAPER FACE FLANGES

The new TUBE-TURN* 125 lb. light weight, forged steel, taper face welding neck flanges (patent pending) can cut costs three ways:

1. You eliminate the hazard of breaking cast iron and semi-steel valves, fittings and equipment such as pumps and compressors, caused by overstressing the bolts to get a tight seal when regular ASA steel flanges are used.
2. You avoid the necessity of using more expensive 250 lb. valves with 300 lb. companion flanges.
3. The new flanges cost less, weigh less and take less storage space than the 150 lb. flanges they replace.

Maximum service pressures are the same as for Class 125 cast iron flanges in ASA B16.1, namely: 125 psi (gage) saturated steam; 175 psi (gage) liquid and gas (WOG) at 150°F.

Here is another example of the cost-saving advantages you realize when you specify TUBE-TURN products and buy them from your nearby Tube Turns Distributor.

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pipeline people • *Cont'd.*

succeeds Mr. Leadbetter as president. H. A. DIETRICH was promoted to vice president in charge of the Industrial Silencer Division.

Three new district sales managers have been named by General Electric Co., Syracuse, N. Y., as part of an expansion of the firm's microwave marketing organization. SAMUEL R. MCCONOUGHEY is managing the new microwave office in Dallas. RALPH W. MAY and A. R. SINCLAIR, both of whom were formerly microwave sales engineers in Syracuse, have been named district managers for G-E microwave in Redwood City, Calif., and Atlanta, Ga., respectively.

Wilber H. Mack
Am-La

J. J. Trebilcott
Mich-Wis

C. J. McInerney
Mich-Wis

S. R. Sawyer
Trans-Canada

WILBER H. MACK has been elected executive vice president of American Louisiana Pipe Line Co. and Michigan Wisconsin Pipe Line Co., Detroit. Mr. Mack will continue as director and general attorney for both companies. He also is secretary of American Louisiana, director and general attorney of the affiliated American Natural Gas Service Co., as well as director, vice president and secretary of American Natural Gas Production Co.

JAMES J. TREBILCOTT has been promoted to manager of operations, Michigan Wisconsin Pipe Line Co. At the same time CHARLES J. MCINERNEY was named secretary.

S. R. SAWYER, formerly of El Paso (Texas) Natural Gas Co., has joined Trans-Canada Pipe Lines Ltd. as chief engineer. Before joining El Paso nine years ago, Mr. Sawyer spent three years with Cooper-Bessemer Corp.

JOHN C. WALLACE has been named to the new position of vice president, operations, of the Walworth Co., New York. He will be in charge of the company's manufacturing, engineering and development activities. Mr. Wallace joined Walworth last year as vice president of manufacturing.

WALTER H. DAUB JR. has been promoted to sales development representative of Pittsburgh (Pa.) Coke & Chemical Co.'s industrial chemicals division. He will transfer from the Philadelphia territory to Pittsburgh.

The following personnel changes were announced by the Alberta Gas Trunk Line Co. Ltd., Calgary, Alberta: ELDON V. HUNT from chief engineer to general superintendent in charge of all operations; E. D. HAVERLAND from district pipeline

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MEASURE PIPE PROTECTION WITH A CALENDAR

How should pipe protection be measured? By first cost? By ease of application? By appearance?

With all the claims made for protective tapes, too often the most important consideration is overlooked—the simple point of how long and how well it will protect the pipe.

Since 1941, when TAPECOAT originated coal tar coating in tape form, this protection has proved to be the best that money can buy for combatting corrosion underground or under water. Lines in service, TAPECOATED as far back as 17 years ago, show no signs of deterioration —a record of uninterrupted performance *no other type of tape can match*. Think what this means in terms of preventive maintenance and elimination of replacement costs!

After all, hot-applied coal tar has proven over the years to be the most dependable and enduring protection. And because TAPECOAT is a hot-applied coal tar coating in tape form, it offers the same lasting protection.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

Write for complete details today.

PROVED IN SERVICE

...Underground or Under Water on

Pipe	**Tanks**
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Service Connections	**Conduit**
Mechanical Couplings	**Cables**
Fittings	**Splices**
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TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job. Available also in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

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PIPE LINE HALF SOLES

SLEEVES

ON THE JOB CONSTRUCTION

CONCRETE RIVER WEIGHTS

One of the many Edwards Concrete River Weights installations on Texas-Illinois Natural Gas Pipe line.
Edwards Split Welding Sleeves also used on the line to insure perfect joints in swamps, rivers and safety zones.

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pipeline people • *Cont'd.*

superintendent to division pipeline superintendent; and C. T. McCALL from district measurement superintendent to division measurement superintendent.

WALTER C. SMITH has been appointed southeastern district manager of Stuart Steel Protection Corp., Plainfield, N. J. He will maintain offices in Atlanta, Ga. JOHN J. SMITH succeeds Walter Smith as a sales representative covering New York and New England.

Black, Sivalls & Bryson Inc., Kansas City, Mo., has opened a sales office in Detroit to serve Michigan and the Toledo, Ohio, area. PAUL F. ANDRE has been appointed sales engineer for the territory. BS&B also has named ED RHODES manager of its Farmington (N. M.) oilfield district.

JOHN J. PENDER has been named personnel director of the Ludlow Valve Manufacturing Co. Inc., Troy, N. Y. He has been with the company for 22 years. Ludlow also announced the election of FORBES M. MESTON to the office of treasurer.

AGAIN "Something New and Better for Pipe Lines . . .

Stainless Steel Banding

Extra Strength

Double Convolute

Maloney PULL-ON TYPE MOLDED CASING SEAL

The molded seal for any job. Double accordian design provides flexibility for eccentric installations, with plenty of room for longitudinal movement in either direction. Ribbed inner surfaces and stainless steel bands seal the rubber to the pipe to form an impervious joint. Maloney compounded rubber is extra thick at pressure and shear points eliminating the need for additional shielding. Long life, free from checking and other aging symptoms, is assured by production quality control of rubber compounding and molding. Installs with Stainless Steel banding for long life. Available immediately in the full range of size combinations.

F. H. Maloney COMPANY

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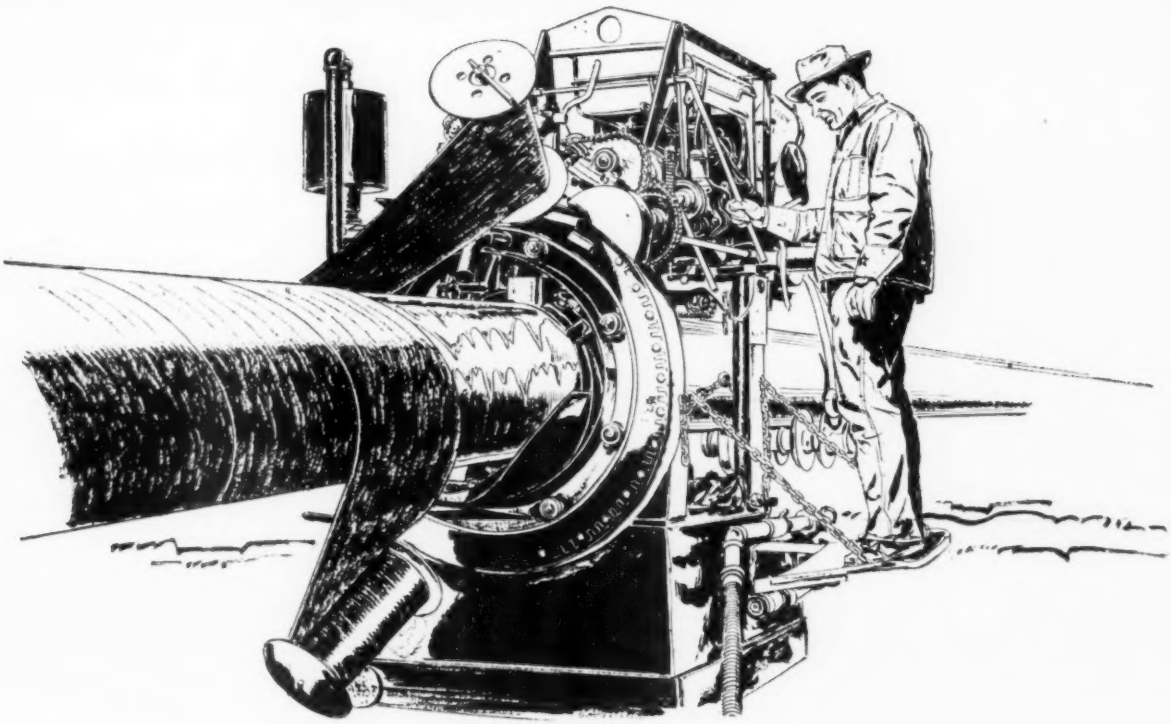

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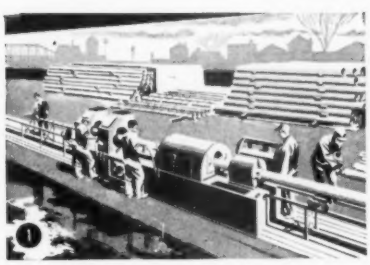

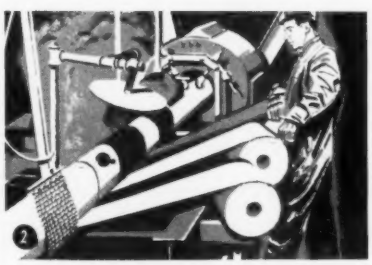

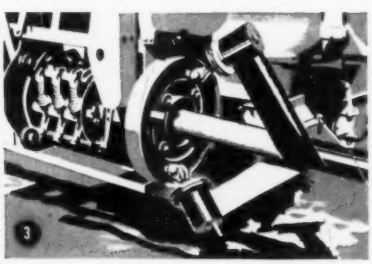

Varying circumstances, job conditions, and even budget limitations prohibit specifying one type of coating for every pipeline. That's why Dearborn offers you all three: asphalt coatings; wax-type coatings; polyethylene plastic tape. These superior coatings, together with the correct primers and wrappers, may be applied at the mill, railhead, by hand or Traveliner. Your local Dearborn representative can help you select the right coating combination for your specific job at lowest possible cost.

CALL YOUR DEARBORN MAN OR WRITE FOR INFORMATION

1. Asphalt Coatings. Write for your copy of Bulletin 3083-A.
2. Wax-Type Coatings. Write for your copy of Bulletin 3050.
3. F.O.S. SAFE-T-CLAD Polyethylene Plastic Tape. Write for Bulletin 3002.

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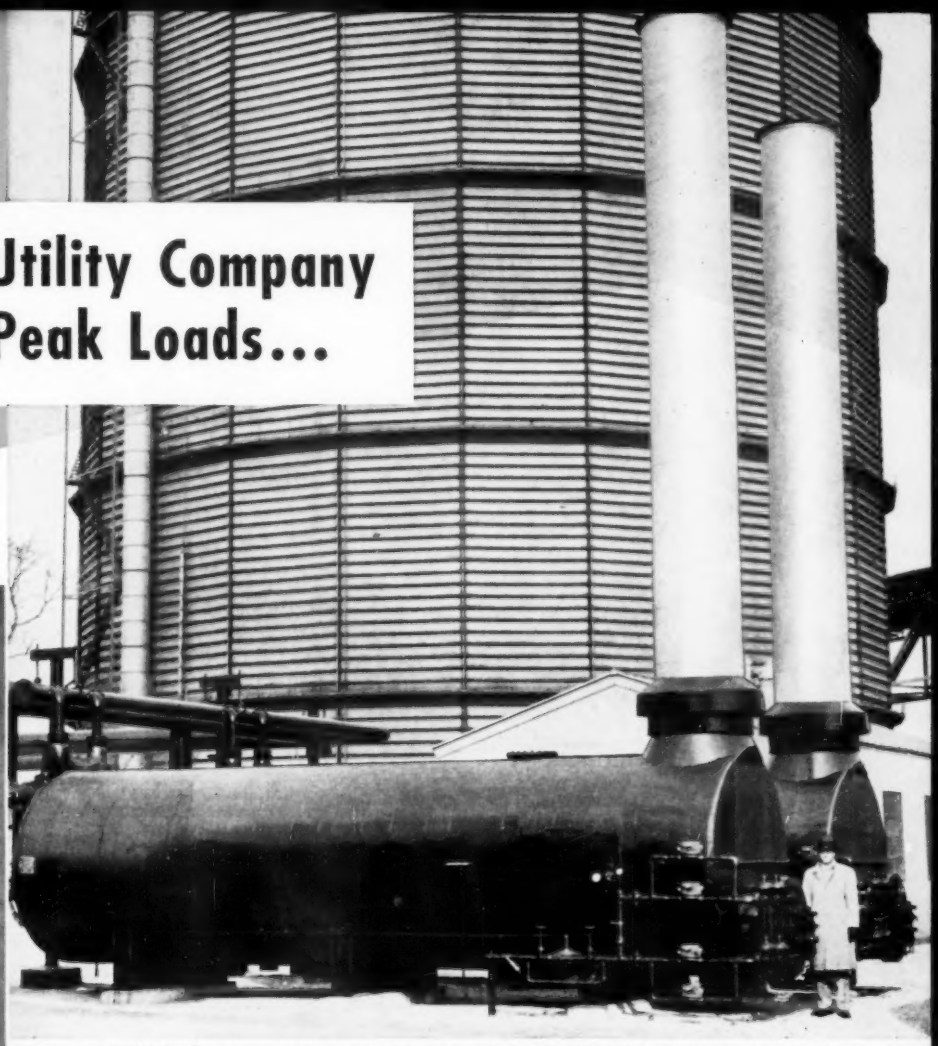
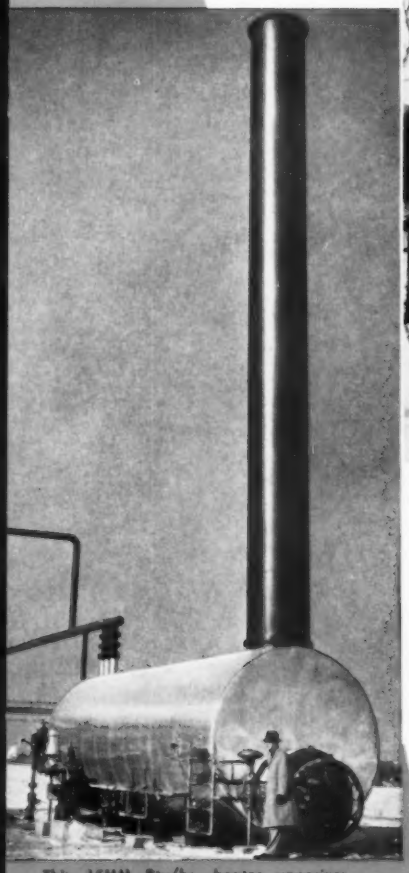


These two 10MM Btu/hr. heaters will vaporize approximately 10,000 gallons/hr. of LPG each. They are fired with natural gas, and are tied in with the complete automatic controls for mixing LPG, air and natural gas.



This 15MM Btu/hr. heater vaporizes approximately 15,000 gallons/hr. of LPG.

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As every gas utility company knows, there are several periods of peak demand which they may be hard-pressed to satisfy . . . unless they take positive and specific steps to provide a *reserve* gas supply when the need arises.

One large midwestern gas utility company* has solved this problem with the installation of three BS&B water bath indirect heaters which can vaporize butane and propane into the city mains at a rate of approximately 35,000 gallons per hour.

These heaters will handle the LPG at an inlet temperature of 10° F. and give an outlet temperature of 130° F. All are completely automatic, and require no operators except for an occasional routine check. During their first two years of operation, maintenance costs have been zero.

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This dual-purpose unit, that accurately and dependably regulates the gas pressure and measures the flow, is ideally suited to gas distribution systems where pressure elevation is imminent or a part of future planning. There's no need for re-arranging piping or adding extra fittings when installing the Sprague Combination Meter and Regulator.

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